

*New Edition*

PSYCHOLOGY  
AND LIFE



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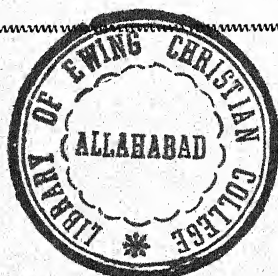
# PSYCHOLOGY AND LIFE

*A Study of the Thinking, Feeling, and Doing of People*

INCLUDING A SECTION ON PHYSIOLOGICAL BACKGROUNDS

*Floyd L. Ruch*

ASSOCIATE PROFESSOR OF PSYCHOLOGY: UNIVERSITY OF SOUTHERN CALIFORNIA



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# PREFACE

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## *On Several Scores*

IN THE FOUR YEARS which have elapsed since the publication of the original edition of *Psychology and Life*, life itself of course has not changed. But through the work of many laboratories, many teachers, many students, our knowledge of it is by some fraction greater. Clearly this is as it should be, for in view of the world situation our need for this knowledge is greater than it has ever been.

Students continue to be interested in their problems of personality and adjustment. They have not lost their desire to understand, on a basis of scientific background, the forces that mold their development. Indeed they have shown that once interested they are willing to go deeply into the study of human make-up and behavior. Interest in social problems and the individual's relation to them in particular is, obviously, keener than ever before. This again is but a reflection of the fact that social problems—in the world sense, at least—are far more serious even than they appeared to be four years ago.

People are important in a way that any particular state can never be important. States come and states go, but people must be there first. Psychology is the science which attempts to describe, understand, predict, and control the behavior of people. There never has been a time when this understanding was more important. Powerful nations in the world are fighting over the issue of the state as a servant of man vs. man as a servant of the state. In so doing neither the man nor the state is being served. To help straighten out this tangled

mass of human relations is the task of psychology and the other social sciences. No challenge to study was ever greater.

On several scores, then, a revision of *Psychology and Life* was in order.

Two working principles guided the writing of the original edition of this book. The author tried to meet the needs and interests of the students without loss of scientific rigor. His colleagues from all over the United States were generous enough to indicate their frank appraisal of the first effort. Their consensus has been that the writer succeeded rather better in meeting the interests of the students than in developing a uniformly high level of critical scientific thinking and background. The steering principle for this revision became to increase the scientific rigor without loss of interest. And through it all has run a deep concern for the individual in a war-torn world.

The revision, it is hoped, is now a full-blown General Psychology.

Among the many psychologists to whom the writer is particularly indebted for guidance Professor *R. M. Elliott* of the University of Minnesota still deserves first mention. Professor *E. R. Hilgard* of Stanford University remained vigilant lest his suggestions and admonitions of four years ago go unheeded. To Professor *D. G. Marquis* of Yale University goes deep gratitude for careful reading of the galleys and especially for the judicious mixture of praise and reproof that brightens the life of a textbook writer; to my brother Dr. *T. C. Ruch* of the Yale University School of Medicine, appreciation of efforts to eliminate gross errors in a simplified treatment of the nervous system. Perhaps greatest of all is my debt to the students who have helped me keep the emphasis on *life* without slighting *psychology*.

May, 1941

FLOYD L. RUCH

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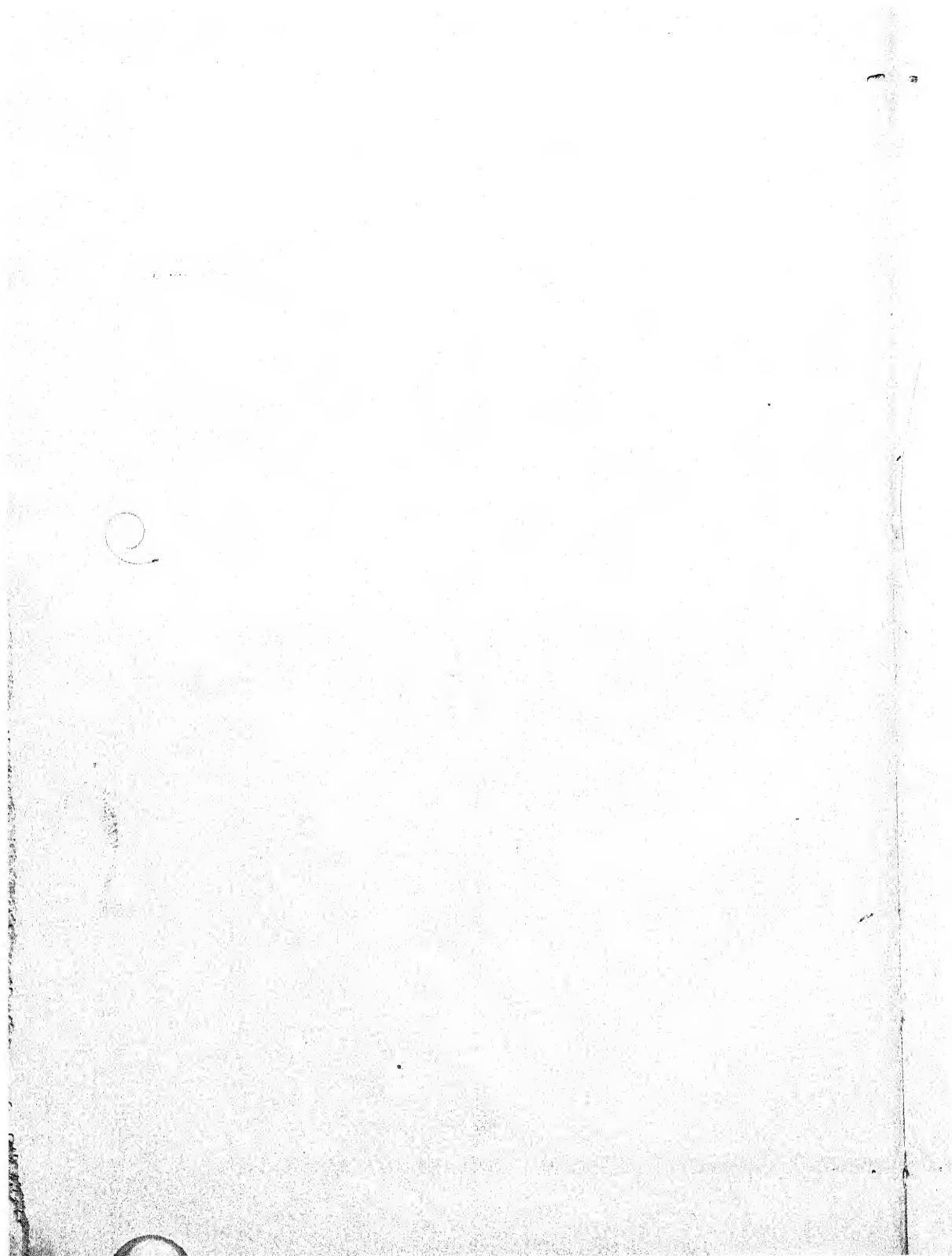
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PART ONE

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*Foundations*



*"Man himself is the crowning wonder of creation; the study of his nature, the noblest study the world affords."* GLADSTONE

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## CHAPTER 1

# PREVIEW OF PSYCHOLOGY

*Superstition—philosophy—laboratory . . . this is a brief history of the modern science of psychology. Consciousness—behavior—unconscious behavior—abilities—motives . . . an understanding of these is its object. Observation and experimentation are its methods.*

**H**UMAN BEHAVIOR has been studied from many points of view. From the very earliest times man has been interested in himself. In general, his first attempts to understand himself were *superstitious*. That is, human nature was explained in terms of supernatural spirits or demons. If a person laughed, it was because the spirit of laughter possessed him; if he cried, it was because the demon of despair possessed him. This sort of explanation did not get very far. To say that a mentally disturbed patient is "possessed of the furies" does not tell you how he got that way or how you can help him get well.

Gradually people came to distrust the superstitious explanations and turned to philosophy to find the meaning of life and man's place in the world. The philosophers eventually turned to science

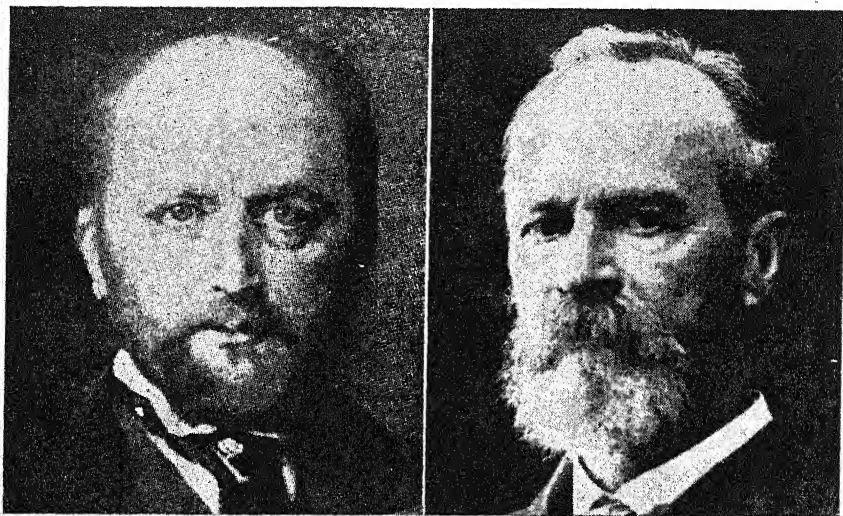


FIGURE 1. Two sons of an illustrious father exemplify the transition in psychology from philosophy to science and life. The father, William James, Sr., was a philosopher. His son William (right) was one of the first psychologists, while his son Henry (left) became a forerunner of the modern psychological novelists.

for facts to guide their thinking; scientific methods for studying were developed. It soon became apparent that the study of man was too big a job for one science. Today we have the biological sciences, which study how man and other animals grow and reproduce, and the social sciences, which deal with the cultural conditions and social institutions that cause groups of people to act in a certain way.

Psychology stands somewhere between the biological and the social sciences and is a part of each. [Psychology is the science which seeks to predict and control the behavior of individuals and groups through understanding the underlying abilities and motives]

### *What Psychology Is and Does Today*

LET US get a clearer picture of what psychology is and does by looking at some of the problems it attempts to solve.

#### *Psychology helps you understand yourself*

It is amazing how little you understand yourself, considering how much time you spend thinking about yourself. A study of

psychology will cause you to be less puzzled by the things you think, feel, and do. It will help you answer such questions as: Why do you sometimes feel blue and miserable without apparent cause? Why do you sometimes laugh at a sad scene in a movie when men and women around you are honestly crying—when you too really feel like crying? How can you lead people to like you? Do you want to be a doctor, a teacher, a lawyer, an engineer, or a business man or woman? Have you the proper make-up to be successful in the career of your choice?

How did you get the way you are? If you are curious about the conditions of your birth and life which have directed your development, you will be interested in the study of psychology. You will learn that you are what you are today partly because you have been shaped by heredity—not alone by inheritance from your parents but also from the long line of your ancestors reaching into the pre-historic past. You will learn also that you are what you are today partly because of the conditions which have surrounded you at home, in school, on the playground, in church, in your social life. You will come to have a better appreciation of how you as an individual can improve your environment.

Are you worried because you are not getting along in your studies? Do you find many of your subjects dull and not worth while? Are you certain that you are taking the right courses? Do you study efficiently? A survey made of the study habits of one hundred freshman students showed that only five of them had any study plan or previous instruction in study. If by this time you do not have a workable study plan, you will welcome the many ways that experts have found for improving efficiency in learning.

The study of psychology should help you solve all these problems by giving you a better understanding of yourself.

### *Psychology helps you understand others*

Why do people do the things they do? How did *they* get that way? Why does plain-looking Sally have more dates and seem happier than beautiful Brenda? Why is twenty-year-old Smith more self-conscious and miserable over his lack of a car than his uncle is over the wooden leg which serves for the real one lost at Château-Thierry? Why does Henderson, whose father is a doctor, want to



quit school and become an aviator, while Gherig, whose father is an airlines executive, wants to be a doctor? Why does seventeen-year-old Francis insist that all his friends call him Frank?

These are just a few of the many interesting problems that we see about us in daily life. In the following chapters we will study such problems as these in our attempt to see why human beings behave as they do.

One course in psychology will not enable you to answer completely all these questions. No book, no course, no teacher can bring about perfect insight into the vagaries of human nature, because, after all, many of the answers are still beyond the scientist; but as you study psychology, you will find yourself less often puzzled than you formerly were by the things that people do, feel, and think.

### *Psychology helps make the world a better place*

If you are to live happily and work effectively with others, you must learn how to modify the parts of the world in which you live. Again psychology helps show the way. Even the so-called self-made man is made not by himself alone. Every social group with which an individual has contact tends to modify and direct his behavior and development.

Are you aware that nearly 40,000 Americans have been killed in a single year in automobile accidents? Has your life been affected by the struggle between capital and labor going on at the present time in the United States? One of the basic economic facts of today is that the production of goods is well advanced while the distribution is poor. Practically everybody agrees that this is true, but there is considerable argument as to the nature of the cause. Some blame the Reds; others blame the capitalists; some blame the government; others blame democracy itself and think that some other form of government is needed. These are all social problems to which the psychologists can contribute information and many practical suggestions.

Juvenile delinquency and the crime rate in the United States are greater than in any European country, despite our superior public-school system. Why? In spite of our all-out defense program, millions of previously self-supporting individuals are on re-



lief or are engaged in made-work. Why? Immigration into the United States has been sharply reduced. How will this affect us?

Human happiness grows out of a harmonious adjustment of life to the conditions imposed by society. Sometimes these conditions are good; sometimes they should be improved. Society expects its college graduates to be leaders in the life of the community. Numerous surveys show that college graduates more frequently become leaders than do less favored persons. A thoroughgoing knowledge of psychology will help you serve society as well as yourself.

### *How the Subject-Matter of Psychology Has Changed*

PSYCHOLOGY has been an experimental science for barely more than a half century. In its early days as a science psychology was almost entirely physiology. The first psychologists studied the structure and function of the sense organs. They strove to establish exact mathematical relationships between the strength of a stimulus, such as light or sound, and the strength of the sensation aroused. These early workers deserve the utmost credit because they were successful in taking psychology out of the hands of the philosopher and the theologian and putting it on its own feet as an experimental science.

But they were so earnest in their desire to show that human behavior and experience could be studied by scientific means that they sometimes forgot the social significance and practical importance of the human activities studied. Whereas the reaction of one human being to another in society is one of the most fascinating of all studies, these early psychologists created a dry subject-matter dealing with man in the laboratory but not in life. There was a perfectly good reason for this early neglect of the social implications of human behavior. Simple phenomena are bound to be easier to observe and experiment upon than are the more complex happenings in the natural universe. Social behavior is invariably complex and accordingly appeared to be less susceptible of scientific analysis than relatively simpler phenomena, such as sensations. As psychology advanced and conquered the simpler aspects of human behavior, its workers became bolder and started

to study the more complex problems of thinking, emotions, intelligence, character and temperament, personality adjustment, and motivation. These complex but socially significant problems are the ones which will be given greatest consideration in this book.

In spite of its short past as an experimental science, psychology has had a long history. It is instructive to trace this history by examining some of the earlier definitions of psychology.

### *Psychology as the study of the soul*

The word psychology means science of the soul, reflecting the original conception of the soul as a specific substance of which mind was composed, existing without form, size, color, or other physical attribute, and capable of feeling but not of being felt. But how could there be a "science" of the soul? Science implies measurement, and measurement is simply refined and standardized sensing. Thus the concept of soul is not a problem in modern psychology but, of course, has its proper place in religion and philosophy.

### *Psychology as the study of the mental powers*

The mind was later conceived of as a bundle of powers or faculties capable of separate existence and independent function. Will, memory, imagination—all were thought to exist and function independently. Philosophers talked of "pure reason" as though it were an entity existing and functioning independently of other "faculties." Psychology was thought of as the study of these mental powers.

In the nineteenth century the phrenologists carried this conception of mind as a bundle of powers or faculties to its absurd conclusion by assigning to each of the faculties a throne in some nook or cranny of the brain. They argued that the person who had a great deal of a particular faculty would have a bump on his skull at the point where this power was supposed to be located (as though soft, yielding brain tissue could force the solid bone of the skull out of place). It is interesting to note that when we stimulate the part of the brain thought by the phrenologists to be the center of religion the man twitches his leg. Compare the phrenologist's map shown in Figure 2 with the figure near the beginning of Chap-

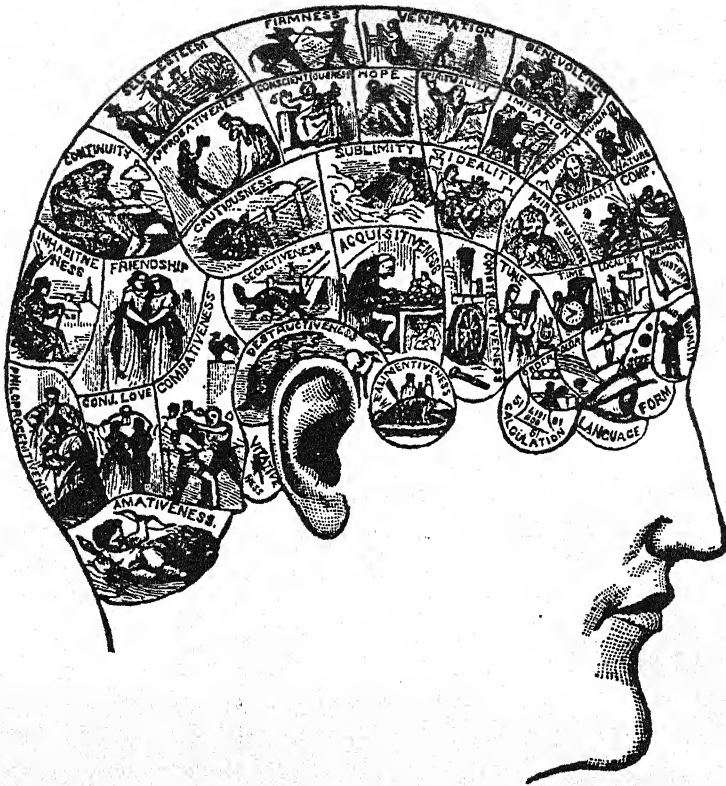


FIGURE 2. *A phrenologist's map of the brain.*

ter 18 which gives the actual findings of scientists over the years. You will see that there is no correspondence between them, either in location or in function represented. No longer do you see "faculties"; modern research has shown that the only type of brain localization to be found is localization of types of function—visual, auditory, tactual, and so on.

Because so many untrue and confusing notions concerning "mind" still persist, psychologists are reluctant to use the term. There can be no science of mind when mind is falsely thought of as faculties, but, since the term "mind" has no other good equivalent in English, we are forced to use it with reservations. As used by psychologists today, the term includes a wide variety of activities whereby the individual adjusts to the world. The term refers es-

pecially to those activities which have been influenced by past experience or are capable of influencing future adjustments of the individual.

### *Psychology as the science of consciousness*

The study of consciousness, or awareness as personally experienced, has led to many complexities and to much confusion.

What is this thing called consciousness? A medical student once gave the following definition: "Consciousness is that which one loses when placed under ether." Upon being asked to state his definition from the positive rather than negative approach, he replied quite readily: "Consciousness is that which one regains as the effects of the ether wear away." Although our medical friend did not define consciousness, he nevertheless stated an important fact concerning its relation to the physical and chemical conditions in the blood produced by ether. As a matter of fact, consciousness needs no formal definition. We all know what it is—in ourselves. We strongly believe that our neighbor is conscious when his behavior resembles ours at a time when we know ourselves to be conscious, although we can never directly observe the consciousness of another. It must be taken by analogy and on faith.

Psychology has been defined as the science of consciousness. Such a definition is inadequate, however, because psychology is interested in more than consciousness. Recent advances in our knowledge of abnormal psychology have shown us the importance of unconscious events in determining both our behavior and our consciousness at any particular moment. Certain experiences affect us in ways that are never revealed directly in consciousness but persist to influence or motivate our reactions to objects and situations. In hypnosis we have excellent examples of the unconscious persistence of instructions to act in a certain way.

The writer once hypnotized one of his students at an informal social gathering. While the student was in the hypnotic trance, he was given the following instructions: "When you wake up, you will have no memory of what I am saying or of what is taking place now. I will awaken you at eight o'clock, and you will enter into the conversation as though nothing had happened. As the clock strikes eight-thirty, you will draw your handkerchief from your

pocket and throw it in the face of Professor X." The student was removed from his trance and reported that he had no memory for the period during which he was under hypnosis. He entered into the conversation, and as the clock struck eight-thirty his face registered an expression of intense, frightened determination. He drew his handkerchief from his pocket and approached Professor X, a dignified and elderly person. Suddenly he spun on his heel, threw the piece of cloth on the floor and stepped on it, turning to the writer in bewilderment. "What made me do that crazy thing? It was all I could do to keep from throwing it right in Professor X's face." This simple experiment, which could be duplicated by any experienced hypnotist, shows how an unconscious direction can persist, unknown by its possessor, to influence his behavior.

The action of unconscious motives is not limited to the hypnotic trance but occurs quite typically in ordinary life situations. Many a like or dislike in adult life can be traced to some forgotten event of childhood. The writer is familiar with the case of a man who refuses to drink milk. He likes malted milks, milkshakes, and ice-cream but will not drink plain milk. A little investigation of the early childhood of this individual brought out a very significant fact. As a young boy he was devoted to the family's pet cow, Pansy. Pansy was sold despite his protest. For a time the parents attempted to deceive the boy into thinking that the new owner of Pansy was sending a quart of milk each day. The boy finally discovered his parents' trickery and henceforth refused to drink milk at all. The parents tried persuasion and then force. The result was a deep-seated, unpleasant emotional association which made milk drinking impossible and even revolting throughout the life of the individual. The most interesting thing about this case is that he was unable to tell why he did not like milk. When he was confronted with the above explanation (the facts had been obtained from members of the family), he recalled the experience and admitted its plausibility as an explanation, but he did not start to drink milk. A habit of a lifetime is not easily broken even though the cause of its formation may become clear. In many instances, however, people have been able to eliminate a peculiarity on seeing the real reason for it; this, indeed, is the



basis of treatment in many of the cases which come to the psychologist.

A psychology which limited itself to the study of consciousness would miss much of the story of human adjustment.

### *Psychology as the science of behavior*

Certain extremists among the psychologists became at one time so disturbed over the inadequacies of the methods of studying consciousness that they decided to leave consciousness out of the picture completely. This group would have a psychology which studied mainly the stimulating situation and the response, with little attempt to study what goes on *inside* the individual. How many trials are necessary to learn a given poem under such and such conditions? Will it be better remembered if learned in the morning or in the evening? What effect will drugs have on an individual's responses? What happens when a part of the brain is destroyed? These are typical problems to answer by studying behavior.

However, certain important problems in psychology cannot be studied by the method of behavior alone. For example, does imagery ("pictures in the mind") play an important rôle in thinking? Obviously introspection—the description of conscious states—must be employed in any thorough investigation of this problem.

Continuing this example, let us take the psychologist who was trying to answer the question: "Are these mental images the materials with which we think or are they unessential by-products of thinking?" Subjects were asked to press a telegraph key to record the very instant at which they became conscious of the *image* evoked by a word pronounced by the experimenter. Another group of subjects were asked to press a telegraph key when they became aware of the *meaning* of the word pronounced by the experimenter. It was found that meaning reaches consciousness in less time than is required for the image. This result is held to support the theory that images are not the essential carriers of meaning but are some more or less irrelevant by-product. An experiment of this kind requires that the subject report on his own state of consciousness.

From the point of view of scientific method the distinction

between introspection and the observation of behavior becomes rather unimportant. The psychologist studies the *reports* of the subject's introspections. He studies the words uttered or written by the subjects. In other words, the psychologist studies the *behavior* of individuals who have been instructed to introspect. The way in which these methods are actually used in psychology is discussed in Chapter 8.

The absurdity of attempting to build a psychology which is nothing more than the study of behavior is made clear by the following greeting from one thorough-going behaviorist to another: "You are fine. How am I?"

### *Psychology Has Three Aims*

PSYCHOLOGY, like most other sciences, has three specific aims: (a) accurate description of the individual's adjustments under various conditions; (b) prediction of what his and others' adjustments will be in the future so that plans may be made accordingly; (c) control of human activities—making use of the knowledge thus gained to select or train individuals for adjustment to a particular environment or to modify the environment itself. It does not matter whether your fundamental motivation in approaching the study of psychology is that of "knowledge for the sake of knowing" or that of "knowledge for the sake of its practical value," for the three fundamental phases of scientific activity apply in both cases.

#### *The description of human activities*

Description of human activities is the fundamental aim of psychology. It is basic to the others and in point of time comes first. Prediction and control in any science are based on accurate description. We must first know what happens under different conditions before we can attempt to say what will occur in the future, and we must be able to predict before we can direct the events of the future into some desired channel.

Let us choose as a simple example the scientific description of color-blindness. There are several different varieties of color-blindness. Most common is red-green blindness, from which about

five in a hundred men suffer. Color-blindness may be studied and described entirely in terms of behavior. If we place a heap of red, green, and blue tufts of yarn in front of a red-green color-blind person and ask him to put all of the same color in separate piles, he does a seemingly very odd thing. He will place all of the blues in one pile and nothing but blues in that pile. However, the reds and the greens will be seriously confused, depending on the severity of his defect. Color-blindness is not an all or none attribute but may occur in any degree, from slight color weakness to total absence of color perception. It is harder to describe color-blindness introspectively, but we may assume that color-blindness is the absence of sufficient differences between the sensations experienced to allow the individual to distinguish all the "colors" that a normal person sees as different. The fact that most color-blind persons do not suspect their defect illustrates the limited utility of introspective description in daily living.

### *The prediction of human activities*

Careful study of hundreds of cases of red-green color-blind persons have shown that these persons are ill-fitted for certain occupations. They make poor truck and automobile drivers because they cannot tell a red traffic signal from a green one and consequently are prone to accidents. Our description is so well worked out that once we know a person to be red-green color-blind we can *predict* that he will sooner or later have an accident in situations where safety depends upon the accurate discrimination between red and green.

### *The control of human activities*

Control of human activities in the sense of applying some cure is impossible in the case of true color-blindness. No medicine as yet discovered can cure this condition. No glasses can correct it. But some kind of control is possible. Knowing the limitations color-blindness imposes, the color-blind individual can control his life by selecting a line of work in which distinguishing colors is not essential and by developing hobbies and other recreational skills in which color vision does not enter.

In the specific instance of color-blindness we have gone even



further. We have altered or controlled the surrounding world in one respect, at least, to eliminate the handicap of color-blindness. In many cities traffic lights are no longer pure red and pure green. There is some yellow in the red and some blue in the green. The red-green blind person can see the blue and the yellow and thus distinguish between the two lights.

Description, prediction, and control are of course applicable to the normal as well as to the abnormal person. Vocational guidance gives us a good illustration of how these three aims of psychology can be applied to the normal individual. In the first stage, that of description, the requirements of various careers are stated in psychological terms. A particular individual is tested to discover what his capacities are. On the basis of these observations, we can predict with considerable confidence that he will probably be happy and successful in one occupation, unhappy and unsuccessful in another. The final control of behavior, in this illustration, consists in his choosing the most promising vocation and taking training necessary to prepare for it. The details of vocational guidance will be presented in Chapter 14, for the problem of choosing your life work is about as important a one as you will ever encounter.

### *Is Psychology "Nothing but Common Sense"?*

LET THE LAYMAN ask an astronomer how far it is from the earth to the moon; the answer will be given with great precision and accepted without protest. Let the same man ask a psychologist some question with regard to human behavior and he may or may not accept the answer. Why should this important difference exist? Is it because the ordinary man feels that psychology is "unscientific" and inexact? This is part of the explanation, but there is probably a more fundamental reason why the average man is willing to accept the work of the astronomer but not that of the psychologist. Astronomy has few applications to human life as compared with psychology. Nearly everybody considers himself to be a psychologist; few consider themselves to be astronomers. The fact that a man is typically more interested in psychology than

in astronomy causes him to challenge the former and accept the latter without question.

Many students have told the writer that they were very much interested in psychology but saw no point in studying it from books or in the laboratory. "I am interested in myself and people," one of them said, "as I see them in everyday life. I have made it a point to study human nature at first hand under all circumstances, and I honestly believe that a course in psychology has nothing to give me that I don't already know." How many times has such a sentiment been voiced?

The young man whose views are quoted above was given a sheet containing ten simple statements (see bottom of page) and asked to tell, on the basis of his everyday observations, whether they were true or false. You will notice shortly that all the statements have considerable significance for everyday living. They are questions which one might be expected to answer on the basis of casual observations unaided by experimental procedures, if such observations were sufficient as a means of obtaining information about human behavior.

Here is an opportunity for the reader to test the value of "common sense" in determining the truth of certain statements. The truth or falsity of each of these statements has been definitely ascertained by carefully conducted psychological experiments, giving the reader an opportunity to check his judgment against the known facts. This is an extremely important discipline in training yourself to adopt the scientific attitude. Were we never to check our practical judgment against facts objectively determined, we could go blithely on our way convinced that we were never in error.

Number the lines on a sheet of note-book paper from one to ten. Read each statement carefully and, on the basis of your everyday observations of human nature, indicate whether it is true or false by putting a + (*true*) or a - (*false*) sign after the number corresponding to the statement.

#### "COMMON SENSE" TEST

1. The number of man's senses is limited to five.
2. A child comes into the world with an instinctive knowledge of good and evil. This is his conscience and is born in him.

3. Certain lines in a person's hand foretell his future.
4. If you will stare at a person's back, you can make him turn around. This is a form of telepathy.
5. An expectant mother by fixing her mind on a subject can influence the character of her unborn child.
6. Long, slender hands indicate an artistic temperament.
7. You can estimate an individual's intelligence pretty clearly by just looking at his face.
8. Adults sometimes become feeble-minded from overstudy.
9. The marriage of cousins is practically certain to result in children of inferior intelligence.
10. Especially intelligent children are likely to be weak and retarded physically.

After you have finished, turn to the end of the chapter, where you will find the correct answers, and score your paper. Which ones did you miss? Why were you misled? Upon careful examination of your errors do you find that your mistaken judgment can be traced to an observation on *one case* only? This is a very frequent source of error which will be discussed later.

This test of the validity of judgments based only on common sense was given to 103 students in a course in elementary psy-

TABLE 1: *Performance of Northwestern University Class on "Common Sense" Test*

QUESTION	NUMBER MISSING THE QUESTION
1	93
2	33
3	10
4	62
5	48
6	84
7	71
8	79
9	84
10	62

chology at Northwestern University. Their scores are probably typical of what the college student can do in the way of judging human nature on the basis of practical experience. Observe in Table 1 how many people missed each question. Why should so many people miss Question 1? Why do so few miss question 3?

This exercise has probably convinced you that ordinary common sense is not altogether trustworthy as a guide to the understanding of the complex behavior of man. Common sense, however, does have its place in psychology. Many now well-established principles in modern scientific psychology were once nothing but common sense; now they are tested common sense.

Modern psychology uses several important scientific methods in testing common sense—the experimental method is the most basic and the best. How we experiment with human beings will be discussed in the chapter which deals with thinking, for the experimental method is a way of thinking.

### *How Psychology Views Man*

TO THE POET man is a soul enthroned in a body. To modern scientific psychology, which neither directly affirms nor denies the existence of the soul, man is a reacting organism.

#### *Man is an organism*

By *organism* we mean, in the simplest terms, a group of organs. Some of our organs have as a function the business of keeping our bodies healthy and growing. That is, they function to maintain the body. The stomach, the lungs, and the digestive glands are examples of organs performing the function of maintenance. The other great group of organs are those which function in adjustment. Under the heading of adjustment come such activities as food-finding, mating, work, learning, and thinking. Many organs serve both functions, the circulatory system for example. Psychology is more interested in these organs of adjustment than in the purely vegetative or maintenance functions.

The organs of adjustment fall into three distinct types according to the function they perform—receiving mechanisms, connecting mechanisms, and responding mechanisms.

1. *The receiving mechanisms.* The receiving mechanisms, or *receptors*, are the essential parts of our sense organs which respond to conditions in the outer world or environment. They are found in the eye, inner ear, on the tongue, in the nose, in the skin, in muscles and joints. Each receptor is sensitive to only certain spe-

cific ones of all the various external conditions impinging upon it. The eyes, for example, are not sensitive to sound, nor do the ears give us the taste sensation.

Without receivers we would be literally and figuratively "in the dark" all the time. A blackout would seem no different from a sunny day on a Southern California beach. The roaring dive of a bomber would be as silent as the stealthy approach of a submarine. Fatigue, hunger, and pain would be unknown to a person completely without receptors.

2. *The connecting mechanisms.* The connecting mechanisms, or *connectors*, are the organs which connect the receivers with the organs of response. The most important structure serving this function is the brain and nervous system. In man the connection between receptor and effector is rarely direct, usually passing through the brain or spinal cord. The blood stream also functions as a connecting and coördinating system. The effect of activity at one region of the body may be transmitted by the blood stream to the other parts. If a muscle of the right arm is exercised to the point of complete fatigue, the other muscles of the body will become tired. One explanation of this is that chemical substances produced by the exercising of the arm-muscle group are distributed by the blood to all parts of the body.

3. *The responding mechanisms.* The third group of organs performing functions of adjustment are called organs of response, or *effectors*. These are the glands, which secrete, and the muscles, which contract. Their action involves manipulation or change of the individual and of the external world surrounding him.

Suppose, for example, that the temperature of the room in which you are studying becomes too high for comfort; you turn off the radiator valve. The action of a group of muscles in response to stimulation of a group of receptors has brought about a change in your external world. As a result of your act the world has, for the moment, become a slightly better place in which to live. Glandular responses also help on occasion to make the world more livable. Suppose that you get a cinder in your eye. Tears are secreted in quantities sufficient to wash the foreign object away. A glandular response of this sort is just as adaptive as the muscular activity in the preceding case.

*Man lives in an environment*

We have already referred to events in the external world as acting on the organism through its receiving mechanisms. We call those events stimuli. The word *stimuli* is the plural of *stimulus*, the Latin word for goad. In the strict terminology of physics a stimulus is some form of energy. Stimulation of a receptor accordingly implies the application of some sort of energy to it. Stimulation is the work performed when that energy strikes the receptor. The beginning student should be careful to note that in the case of an organism so complex as man the idea of a single stimulus acting upon a single receptor is an abstraction. Stimuli act in patterns, many at a time. For example, a train passing us might afford stimuli to the senses of sound, sight, smell, warmth, vibration, and touch, and many receptors of each of these kinds would be stimulated. The student should also bear in mind that the stimuli can come from within an individual's own body. Thirst, for example, is stimulated by a dryness in the throat (p. 76).

The notion of environment is necessary to the concept of organism. An organism could not exist or develop except in an environment. The term environment is extremely inclusive. Environment is made up of social situations and institutions as well as of physical objects. Moreover, there is no sharp line of demarcation between organism and environment. Eventually our lunch becomes a part of *us*. Who is to say at what point the lunch ceased to be environment and became organism? The same is true of the air we breathe and the water we drink.

*Behavior patterns and neural patterns*

In psychological terminology a sequence of actions which adjust the organism to a particular situation in the outer world or within the organism itself is called a behavior pattern. Coughing, sneezing, slapping a mosquito, walking, eating, jumping out of the way of an automobile, and voting at an election are all examples of behavior patterns. Some behavior patterns are very simple indeed, as the sudden withdrawal of the hand from a hot

object, and may occur without full coöperation of the brain. Other behavior patterns are extremely complex, as the solving of a problem in geometry which is literally "brain-work." Simple or complex, they are essentially the same in that a neural pattern or series of connections between receivers of stimuli and organs of response underlies each and all of them. What these connections are and how they function will be more fully discussed in Chapters 17 and 18.

The new-born baby is a helpless mass of vegetative tissue, quite unable to take care of himself; if completely neglected by adults, he would soon die. He has many behavior patterns, but they are inaccurate and feeble. All in all, the new-born babe is a long way from the complex, efficient, self-sufficient adult. The difference is, however, one of degree. The adult has more complex behavior patterns. The greater complexity of the adult's behavior is largely due to the greater complexity of his neural patterns. In the next chapter we will examine the behavior of the human organism in its simplest stages.

Think of the most complicated machine that you have ever seen—an adding machine, a radio, a printing press. No matter how large or small it might be, the most complicated machine is simple compared to an earthworm. Yet an earthworm is simple as compared to a dog or a horse. All of this is obvious, just as it is obvious that man is more complicated than the lower mammals. You have begun the study of the most complicated system known to man—man himself. If you are hoping that man's knowledge of man is as complete as his knowledge of automobiles and egg-beaters, you are doomed to disappointment. But if you are intellectually alert and curious, you will find the very complexity of your own and others' behavior an added incentive to study.

### *Man functions as a whole*

The human organism, like the simpler ones, behaves as a whole. This means that each part of us will be influenced by many other parts. For example, the way you respond to a particular stimulus will depend upon the nature of the surrounding conditions. Look at the line *a-b* in Figure 3. How does it compare with line *m-n*? Now take a piece of paper and cover the line *m-n*, allowing the line *a-b*



to show clearly. Move the paper away so that more and more of line *m-n* comes into view. What happens to line *a-b*? Now slide the sheet of paper in, gradually covering line *m-n*. Notice what happens to line *a-b*. Line *a-b* is always the same length physically, but it changes psychologically as we alter the surrounding situation.

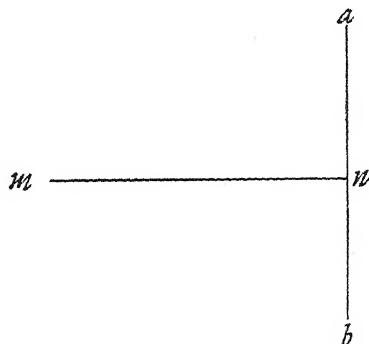


FIGURE 3. Look at these lines in the way suggested in the experiment on this page and you will see an example of man's functioning as a whole.

This is only one example of the important fact that man functions as a whole—that events in one part of the body influence those in another part. Suppose that you hold in your hand a ham sandwich. Your reactions to it will depend on internal and external conditions. If you are hungry, you may eat it. If you are a devout Catholic and the day is Friday, you do not. The stimuli given off by the sandwich are the same whether you are hungry or well fed, whether the day is Friday or Thursday, but your behavior varies and is determined by many factors besides those which reside in the physical object itself.

### *Rats and Men*

THE VISITOR at a psychological laboratory when shown the cages of white rats and other animals usually found there frequently expresses astonishment. The ordinary man thinks of rats as belonging to biology rather than to psychology. Why does the psychologist study rats and other animals? There are at least three answers to this question.



The exigencies of the experimental method often involve interfering with the daily living of the human individual to such a degree that he refuses to participate. The laboratory animal must be employed if the problem is to be studied at all.

Many of the experimental techniques employed by the psychologists involve danger to the subject. One of the most fascinating studies in psychology concerns the localization of particular func-

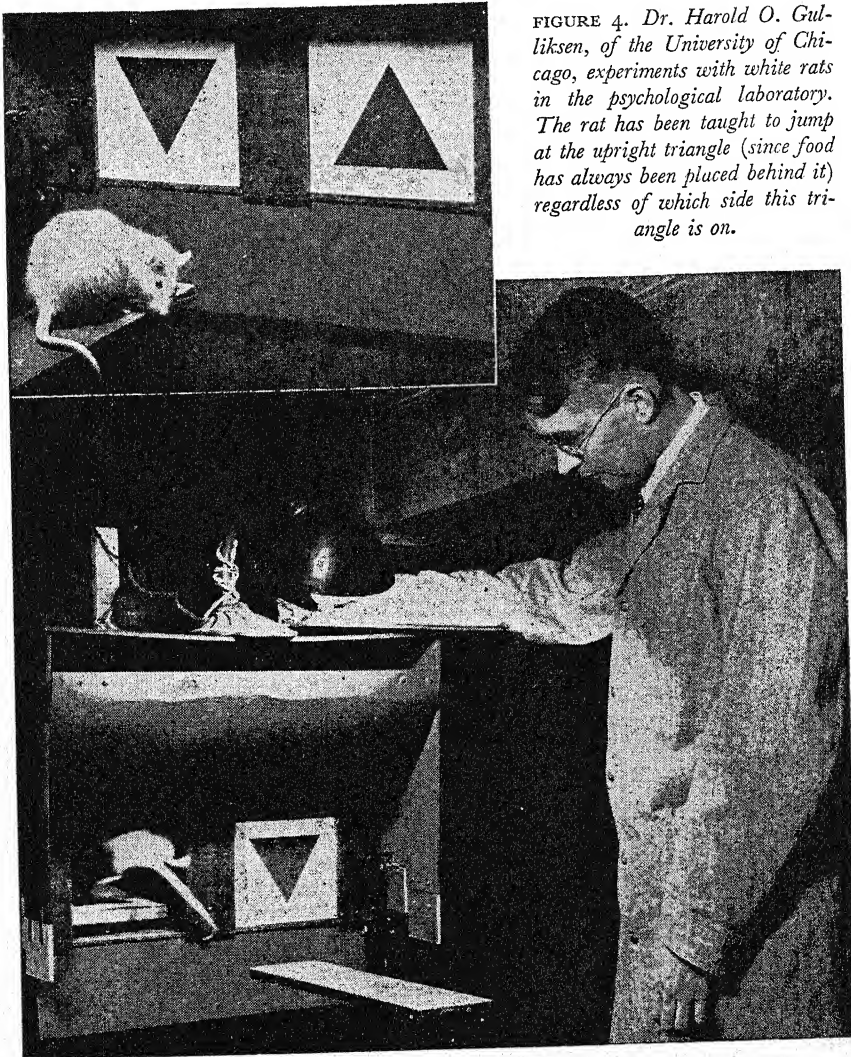


FIGURE 4. Dr. Harold O. Gulliksen, of the University of Chicago, experiments with white rats in the psychological laboratory. The rat has been taught to jump at the upright triangle (since food has always been placed behind it) regardless of which side this triangle is on.

tions in definite parts of the brain and nervous system. A fundamental technique for studying localization of function consists in removing some part of the brain or nervous system in a normal individual, and then observing any changes in behavior. But man quite naturally objects to having his brain tampered with, even for science, and only in wars and accidents can we closely study men's brains. Even then the conditions of investigation are not satisfactory, since the damage of a bullet or a piece of shrapnel is never so neatly limited as the path of the surgeon's knife. Moreover, in making studies of this kind the observer must never interfere with the physician's efforts to cure the patient. The only alternative is the study of animals.

A further advantage of the study of animals is their comparative simplicity. An animal of any desired complexity can be selected for study. Oftentimes it happens that a particular kind of behavior can best be studied in simple forms. There are, of course, dangers in arguing from animal to man. Language and other symbolic behavior are highly developed in man, while practically absent in animals. Nevertheless, men and animals are enough alike in many fundamental respects to warrant cautious interpretation of the behavior of the former from what we know of the behavior of the latter.

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Man's first attempts to explain his thoughts, acts, and motives made use of demons or supernatural powers. As the inadequacies of these explanations became apparent, people turned to philosophy for human understanding. The philosophers looked to the sciences for help. At this stage psychology was born as an experimental science.

Today psychologists use the methods of any science. With the precision possible in a laboratory they observe and describe human activities in order that such activities can be predicted and controlled. Prediction of future behavior is valuable in itself and is the best possible test of the accuracy of description and completeness of understanding. Often future behavior can be controlled by manipulating the conditions which are responsible for it.

Psychologists find that they must regard man as a complex organism reacting to a complex environment. Most of the responses

of the organism are adaptive, i.e., they make the world a better place or they place the organism more advantageously in the world. An organism has sensitive receptor cells which are caused to act by energies from the environment—such as light and sound. From these receptors there are connectors leading to the muscles and glands, called the effectors because they do something—have an effect. The organism functions as a whole, not as separate parts, and the way one part works is controlled by activities of the entire organism.

In looking at man psychologists use the method of describing behavior and the method of introspection. Each of these methods has its advantages and disadvantages. The method of behavior has a wider range of application. It can be used with babies, lower animals, and abnormal human beings. The psychologist can use it on himself or on others. The method of introspection is limited in scope. It can be used only in observing one's own conscious experience. Since much that is important in psychology is unconscious, introspection can never tell the whole story, i.e., psychology could never be a science of consciousness only. The modern psychologist uses both methods routinely and rarely stops to decide which one is "more important."

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*All the statements in the "Common Sense" Test (pp. 14-15) are false.*

The discussions from which these answers can be deduced are found in this book, as indicated below: statement 1, Chap. 7; s. 2, Chap. 16; s. 3, Chap. 12; s. 4, Chap. 8; s. 5, Chap. 2; s. 6, Chap. 12; s. 7, Chap. 12; s. 8, Chap. 13; s. 9, Chap. 2; s. 10, Chap. 13.

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### *Recommended Readings*

DEXTER, E. S., and OMWAKE, K. S. *An Introduction to the Fields of Psychology*. Prentice-Hall, 1938.

Easily and accurately, the authors tell you about the four principal "schools" of psychology; why each arose and why each should perish as an independent and distinct point of view.

GUILFORD, J. P. (Editor). *Fields of Psychology*. D. van Nostrand, 1940.

A group of competent specialists present a survey of the main specialties in psychology.

GOLDSTEIN, KURT. *Human Nature, in the Light of Psychopathology*. Harvard University Press, 1940.

The physician becomes a psychologist. Read the preface and Chapter I in this connection. Goldstein will help you understand that "isolationism" of function in the human organism is an abnormal situation. The healthy and normal organism works as a whole, not as a series of parts.

HEIDBREDER, E. F. *Seven Psychologies*. Appleton-Century, 1933. A readable story of the "isms" in psychology and the men who made them: Plato, Descartes, Wundt, James, Titchener, Watson, Freud, Koehler, Koffka, and Woodworth.

HERRICK, C. J. *The Thinking Machine*. The University of Chicago Press, 1932.

A great physiologist and neurologist struggles with the problems of conscious and unconscious mind. He decides that introspection has its place in psychology but that introspection alone will not tell the story.

HOWELLS, THOMAS H. *Hunger for Wholeness, man's universal motive*. The World Press, 1940.

Howells uses all of the sciences to understand man as a whole.

JAMES, WILLIAM. *The Principles of Psychology*. Henry Holt, 1890.

This is the first good psychology textbook. Psychologists have been busy for fifty years proving by experiment what James knew without benefit of experiment.

KELLER, F. S. *The Definition of Psychology*. Appleton-Century, 1937.

The author describes and criticizes the various definitions and "schools" of psychology and, like Dexter and Omwake, looks forward to psychology as a science, not a debating society.

PERRY, R. B. *In the Spirit of William James*. Yale University Press, 1938.

A brilliant philosopher makes a strong case for belief or creed as a supplement to scientific observation and experiment using William James as a case in point.

WARREN, HOWARD C. (Editor). *Dictionary of Psychology*. Houghton Mifflin, 1934.

Complete, accurate, and useful. French and German equivalents are included when different from the English.

"The development of a human being . . . is the  
climax of all wonders." E. G. CONKLIN

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## CHAPTER 2

# FACTORS IN DEVELOPMENT

*Heredity: a sperm and an egg . . . potentiality. Growth from bawling infants to mature individuals who are alike in some traits and not alike in others is a story of heredity and environment.*

WHEN does life begin? In the Western World we usually think of life as starting at birth; so we date the child's birthday anniversaries from the day he is born. In Japan the child at birth is reckoned as one year of age. This comes closer to dating the beginning of the individual's life from the moment of conception. But even the moment at which the sperm and egg unite to form an individual does not truly represent the beginning of life. Before union of the living germ cells can occur, each must have gone through a period of ripening. Nor do we find even here any particular moment at which we can say life begins. Life is a stream. Generation follows generation. There is no beginning within the history of man, and science sees no ending. The student who is seriously looking for the answer to the age-old question—"Which comes first, the chicken or the egg?"—will be disappointed. Modern

psychology has done no better than ancient philosophy in answering this timeless question. For convenience we accept the moment of conception as the beginning of an individual's life.

### *The Beginning of Life and Behavior*

**L**ET US look at the human being just as life is beginning. What can he do? What are the factors that make people develop? Why are people alike in some ways, different in others?

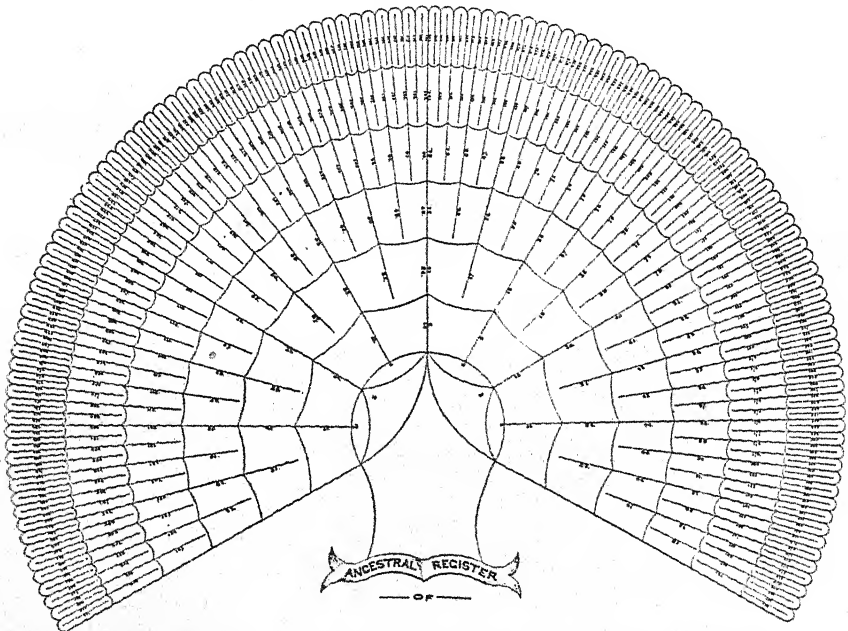


FIGURE 5. That generation follows generation to make up one individual is graphically shown by this Ancestral Register blank, used for filling out genealogies. Though this chart shows the direct ancestors for only nine generations, it has spaces for the names of 511 individuals.

### *Looking at the behavior of the human fetus*

Keeping in mind all the forces in action long before conception, the psychologists begin their study of the human being in the fetal stage. The living human fetus (unborn child) is ordinarily not available for scientific observation, but under certain circumstances, such as ill health of the mother, it is necessary—and



permissible under our laws and morals—for the physician to interrupt the normal process of development within the uterus and deliver the fetus prematurely. The technical term for this process is abortion, a medical procedure hedged in on all sides by moral conventions, laws, and professional ethics.

One of the first systematic investigations of the behavior of the unborn child was carried out in Europe.<sup>1</sup> The early European studies have been followed up and verified in this country.<sup>2</sup> Fetuses delivered surgically at from two to eight months following conception were studied. Since poor health of the mother was the most frequent reason for performing the operation, it must be remembered that the individuals studied were not entirely normal. Also, a general anesthetic was used in some cases, with the result that the fetus would be more sluggish than, and perhaps otherwise different from, the normal. The situation under which the observations were made was abnormal in still another way. When the fetus is in place in the maternal uterus, its blood stream is connected with that of the mother. Oxygen and food materials are being constantly supplied by the maternal circulation. In the case of prematurely delivered organisms this is not true.

The method of study in general consisted in observing the unstimulated individuals and in stimulating them in various ways, noting what type of response took place. What can the unborn child do, as revealed by these investigations?

*Spontaneous movements.* Movements of the head, trunk, and limbs were "spontaneous" in the sense that they occurred when no external stimulus was applied. The head was turned from side to side; the arms and legs were flexed (drawn in) and extended (thrust out). The movements were slow and irregular, involving several joints at once. Often several members of the body moved at the same time. This sluggish, irregular, widespread movement is aptly described as *mass action*, or *irradiation*.

*Externally stimulated movements.* Movements occurred also when external stimulation was applied in various places.

A. Reflexes of the skin. When the skin was stimulated with a brush, by friction, or by pressure, the movements were more jerky than those of the spontaneous sort. They too showed great

irradiation. That is, the application of the stimulus at one part of the body would bring responses almost anywhere and of almost any member.

b. Facial responses. A touch applied to the lip aroused the response of opening and closing the mouth. These movements were probably the beginning of the more complex pattern of sucking. Touching the eyelid was followed by contraction of the lid.

c. Responses from the labyrinth. The *labyrinth* consists of the *semicircular canals* which are a part of the inner ear, although they have no function in hearing. These canals, as their name suggests, are three semicircular tubes leading through the three planes in space. They are filled with a fluid which is placed under stress when the head is moved. Each tube is lined with tiny hair-like receptors, which are stimulated when the fluid presses against them, calling forth balancing movements. It was possible to stimulate these receptors by moving the fetus into various positions in space without changing the relationship of the arms and legs to the rest of the body. The responses occurring to this type of stimulation were turning of the head and movements of the arms and legs.

We have seen, then, that the human fetus, like any organism, responds to stimulation. Secluded in the mother's uterus, however, the unborn infant has no direct contact with the outside world and has, therefore, little chance to learn. Consequently, such behavior as we are able to observe in it is to be regarded as unlearned.

### *Observing the new-born babe*

The next logical step in the study of the human being is observing the new-born child. During the past couple of decades the study of the early behavior of children has taken enormous strides, and many research institutes have been organized for this purpose. For systematic observation of the behavior of the new-born child the conditions of stimulation must be so carefully controlled and standardized that at least every *external* stimulus acting on the child is known. Such control is not possible in the hospital or in the home. In many research institutions, however, observations are made on infants placed in special observation chambers under conditions so well controlled that no chance blast of air, no unex-

pected flicker of light, no unwanted variation in temperature or humidity, no unbidden noise can possibly occur. These chambers are also equipped with special recording apparatus which auto-



FIGURE 6. *Observation chambers are used for the study not only of infants but of older children. The chambers are provided with a wall of special glass through which the experimenters can observe without being seen by the children. Thus undisturbed, the children's natural behavior can be recorded.*

matically registers the amount and kind of body movements made by the baby. Figure 6 shows a typical observation chamber.

*How good is the new-born's receiving equipment?* The study of muscular response is inextricably interwoven with that of sensitivity to stimulation, for it is by eliciting a response that we know that a given set of receptors is functioning. Although the newly arrived baby cannot tell us what he feels or does not feel, he can respond to stimulation. If we stimulate a child's eyes with a flash of light and the lids shut or the pupils contract, we are justified in concluding that the child's eyes are sensitive to light. Suppose, however, that there is no visible response when a stimulus is applied to some set of receptors. Must we conclude that those receptors are incapable of functioning at that moment? Such a conclusion would be only one of three possibilities. It might well be that the receptors are not yet ready to function; on the other hand, it might be that they are ready but that the nerve pathway to the muscles is not complete or functioning, or perhaps that the muscles are not

yet strong enough to make any visible movement. When the child responds, he demonstrates sensitivity; failure to respond, however, does not necessarily demonstrate lack of sensitivity.

With these preliminary remarks in mind, then, let us see how well the new-born infant's sensory equipment works.

A. Auditory (hearing) responses. About twenty-four hours after birth, or as soon as the fluid in the ear has dried, loud sounds will cause most babies to cry. Morgan and Haller tested the reactions of infants between two and four weeks of age to tones of varying pitch.<sup>3</sup> Tones of high pitch tended to stimulate activity, while those of low pitch (64 vibrations per second) tended to soothe infants who were crying and to lessen activity in the others. Since the high and low tones produced different responses, we conclude that the auditory mechanism of babies from two to four weeks of age is sufficiently developed to permit some discrimination.

Another method of testing the auditory acuity of the small baby may be used.<sup>4</sup> When the sole of a baby's foot is tickled, the typical response of extending the great toe and fanning out the little toes occurs. This is an innate pattern in most babies although, like the startle or crying response to sounds, it is sometimes absent. By presenting the sound at the same moment the sole of the foot is tickled, it is possible to *condition* the toe responses to the sound. That is, if the neutral stimulus (the sound) is repeatedly presented at the same or nearly the same time as the adequate stimulus (tickling), the sound alone will come to elicit the response of the toes. (See pp.137-142 for further examples of the conditioning technique.) Thus, where conditioning is successful, the hearing ability of a baby may be demonstrated. In one case a baby was thought to be deaf because he failed to react to sounds which were of high intensity as judged by adults. Happily the child was not deaf, as positive results in the conditioning experiment proved. A mother could save herself a great deal of worry in such a case of suspected deafness by having a competent psychologist apply the conditioning test. Conditioning is a common phenomenon, responsible for a great many of our feelings and other types of behavior, as we shall see.

B. Visual responses. The presence of visual sensitivity in the new-born child is seen in the response of the pupil to light. The student can easily observe the same response in one of his fellows.

To get the best results the subject should be kept for a time under a condition of moderate illumination. When the amount of illumination is reduced, the pupil opens farther to permit the entrance of more light, producing better vision. If a flashlight's beam is suddenly directed into the eye of the subject, there is a constriction of the pupil. The biological function of this pupillary response is to protect the sensitive retina from an undue amount of light. This response is absent in some new-born babies but develops rapidly and becomes quite efficient by the thirty-fourth hour following birth.<sup>5,6</sup>

Chase has conducted experiments to determine whether infants aged fifteen to seventy days can discriminate between various colors in different combinations.<sup>7</sup> Color filters were arranged so that two colors could be projected upon a screen above the infant's head as he lay on his back. The appearance on the screen of the two colors was such that one color was surrounded by the other. When the filter was moved, the center color appeared to move within the field of the other color. That colors could be discriminated by the infants was shown by the movement of their eyes in following the moving color stimuli. It was found that they could discriminate between the colors in the combinations red and yellow-green, red and green, red and blue-green, yellow-green and green, yellow-green and blue-green, and green and blue-green. Control experiments showed that the discriminations had not been made upon the basis of a brightness difference or of some mechanical aspect of the experimental situation.

c. Smell and taste. Smell and taste are very poorly developed in the young infant. In one series of investigations it was found that infants reacted only about 48 per cent of the times to stimulation with puffs of air containing such substances as ammonia and cloves.<sup>8</sup>

Working with citric acid, salt, sugar, and quinine as taste stimuli, the same psychologists found that new-born infants show slight reaction in 85 per cent of the applications and none whatever in the other 15 per cent. Obviously, the sense of taste is only imperfectly developed at birth.<sup>8</sup>

d. Kinesthesia, or movement sense. In the muscles, tendons, and joints of the adult are found tiny sensory receptors which

respond when stimulated by the stretches, strains, and pressures consequent to movement of the body. These receptors give rise to kinesthetic sensations, i.e., sensations of bodily movement. We know from the soothing effect it has upon them that children react to movement of their bodies. Rocking and mild jolting have long been recognized as ways of quieting crying babies. The Shermans studied the development of accurate kinesthesia or muscle sense in infants during the first few hours of life.<sup>5, 6</sup> When the tiny infant is pushed on the chin, he will make defense movements with his hands. The experimenter counted the number of unsuccessful movements the baby made before touching the hand of the experimenter. No baby younger than 21 hours of age made a successful response. Twelve trials were required on the average with babies 50 hours of age, four trials when babies were 275 hours old. This test is not a perfect measure of growth of kinesthesia, as other factors, such as increase in muscular strength and development of the sense of touch, would contribute to the greater success of the older infants.

e. Reactions to pain stimuli. In one series of observations made by the Shermans, the legs and faces of a group of infants were stimulated by needle pricks. They found that no infant at birth responded to single pricks. However, when the stimulus was applied a number of times to get a summation or additive effect, all of the babies, even those under five hours of age, responded to stimulation on the face. The experimenters, of course, were careful to discontinue their stimulation as soon as it was clear that the response to pain was present, i.e., when the babies struggled or cried. Stimulation of the legs did not give such clear-cut results.

f. Other skin sensitivities. The new-born infant responds in varying degrees to the temperature of his milk.<sup>9</sup> The frequency of sucking reactions decreases as the temperature varies above and below normal.

As we have seen, the stroking of the sole of the foot will cause movement of the toes. These and many similar reflexes show that skin sensitivity is present in infants of a few hours of age.

g. Primitive speech sounds. Even during the first thirty days of life many of the pre-linguistic speech sounds are heard. Among these are:



|                      |                         |
|----------------------|-------------------------|
| m as in ma           | y as in yah             |
| n as in nga          | o as in owl             |
| g as in gah          | oo as in pool           |
| h as in ha           | a as in an              |
| w as in wah          | a as in father (rarely) |
| r as in burr and rah |                         |

Notice that the consonant sounds *z* as in *buzz*, *s* as in *hiss*, *p* as in *top*, *t* as in *tom*, and *b* as in *ball* are not recorded. Why is this? Try making these sounds yourself. What is the difference between the *n* as in *nga* and the *s* as in *hiss*? Think how a baby's mouth differs from yours. This list of primitive sounds will become longer when the teeth have appeared to make possible the *fricatives*, such as *z* and *s*, and when the muscles have become strong enough to supply the tension needed for the *explosives*, such as *b* and *p*. Through learning, all the primitive sounds of the pre-linguistic period are organized into the conventional language of the society in which the individual lives.

All these studies show that the new-born baby is already engaging in adjustive reactions to his physical world. Energies and forces, such as light, sound, and pressures, are not passively endured even by so young a creature. The baby does something about the stimuli which act upon him. What he does is pretty inadequate as compared with adult standards, but, although he has a lot to learn, the baby is not completely helpless.

*The behavior patterns of the new-born are plastic.* We have already seen intimations of the fact that the new-born infant can learn. (To the psychologist, the criterion of learning is any change in the behavior of the individual brought about through past experience in similar situations.) Learning usually prepares the individual to adjust better to the world of people and objects in which he lives by the acquisition of a new response or by the loss of one which has no use or is harmful to him. The experiment employing the conditioning method to demonstrate the functioning of a sense organ (p. 30) could be called a learning experiment.

The ability of the human infant to learn during the first ten days of life has been well shown by experiments by Marquis<sup>10</sup> and by Wickens and Wickens.<sup>11</sup> In the Marquis experiment new-born

babies were fed six times daily on milk taken from their mothers' breasts. From the first feeding of these infants, which took place twenty-four hours after their birth, on through the tenth day of post-natal life, the infants were fed under the following conditions. They were placed in an observation chamber like those already described. A record of their activity over a five-minute period was taken. The external conditions, temperature, light, etc., were carefully regulated. A buzzer was sounded for five seconds. The nipple of the milk bottle was then inserted in the subject's mouth, and the buzzer was continued for five seconds after nursing started. The sound of the buzzer was repeated at intervals during nursing. When the bottle was removed to prevent too rapid feeding, its re-presentation was always preceded by five seconds of the buzzer. Note that the babies heard the buzzer only just before and during feeding, and that they were never fed without the buzzer.

A record was taken of the sucking behavior of the infants and of the amount of body movement. Examination of this record showed: (a) The original response to the buzzer (occurring before the conditioning had been started) was an increase in the amount of crying and general activity in the case of some infants, while in the case of others no response whatever was noted. In no case did the buzzer have the effect of soothing the babies at the outset. (b) After a few days of the experimental conditions (buzzer with bottle) the babies started to open their mouths, make sucking movements, stop crying, and cease general activity at the sound of the buzzer *before the bottle was presented*. Notice that these are inborn responses to food but not to the buzzer. In a control experiment a group of babies were given the buzzer at regular intervals but without food following it. As the days passed, this group showed increased crying and activity after the buzzer but no food-taking responses.

This experiment demonstrates how learning can be a potent factor in changing the behavior of human infants from birth on. Possibly learning could occur during the fetal period of life if there were a need or opportunity for it, but the conditions of the pre-natal environment are so nearly constant that very little learning takes place at that time. Following birth, however, the indi-

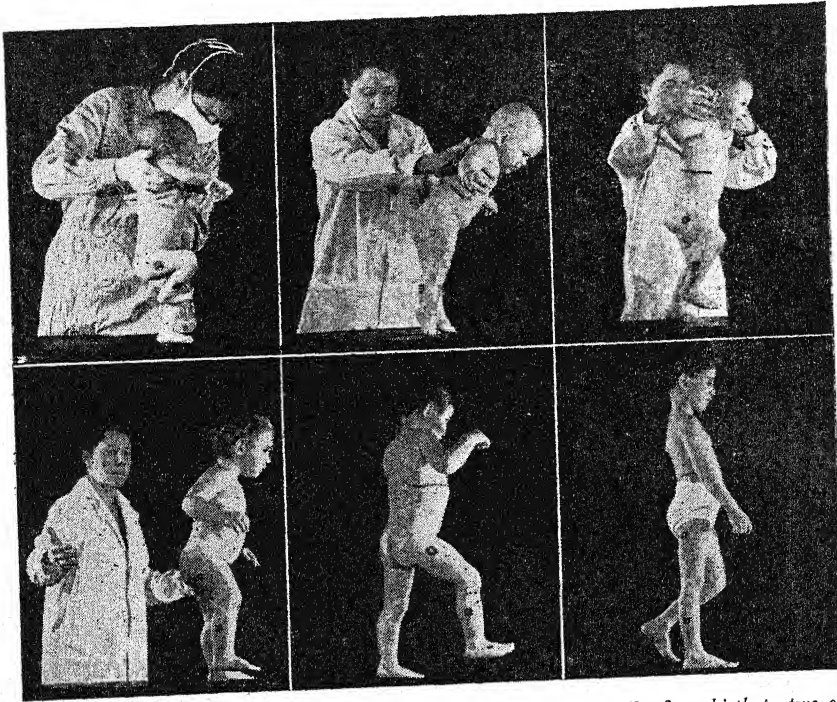


FIGURE 7. *Learning to walk is a process which develops gradually from birth to two or three years. Leg muscles mature and strengthen; reflex stepping movements change to voluntary, directed movements; the sense of balance develops. Last view shows mature walk.*

vidual finds himself in a changing and complex environment. Through learning new responses the individual grows in complexity and thus becomes better adapted to the wide range of situations which will confront him during life.

### *Factors in Development Which Make People Alike or Different*

YOU HAVE just examined the behavior repertoire of the human infant prior to birth and after it. You were probably astonished to learn of the large number of things that the human baby can do. These patterns of behavior are of great interest to the psychologist, because they represent in a general way the inherited foundation upon which learning erects the complex structure which is the behavior repertoire of the adult. After birth, learning

becomes increasingly important as a factor causing differences among people.

### *The factor of opportunity for learning*

Individuals differ from one another in the amount of opportunity they have to learn. Children grow up in a world which presents widely differing environments. The parents of one child may be fond of music. Such a child has many chances to learn about music, to like music, or to play musical instruments. Another child grows up in his father's carpenter shop. This child has an exceptionally good opportunity to learn how to use tools, to make things of wood or metal. Perhaps the parents of a third child are interested in reading. Their growing son or daughter is exposed to the very best in literature; under these circumstances we would expect that the child would learn more about fine writing than would other children.

Must we conclude that opportunity is the only factor which limits mental growth? Hardly. Your everyday experience in and out of school must have convinced you that certain persons will learn a particular activity much more readily than will others having equal opportunity. The same person will learn some things easier than other things. Obviously, there is a second factor operating to make people different.

### *The factor of maturation*

Although behavior present at birth is largely unlearned, that which appears subsequently is not necessarily all learned. Some behavior not present at birth comes into being when, as the result of a growth process called *maturation*, the nervous, muscular, or glandular structures essential to that behavior become ready to function. Until these essential structures are mature, no stimulus will be effective in bringing about such behavior. Maturation is not an all-or-nothing affair. That is to say, an organism is not immature and then suddenly mature. Maturation progresses gradually and structures do not all mature at the same rate.

Let us take an example. At the age of puberty the boy's voice changes. This takes place in practically all boys—in all *normal*

boys. We know that this change in the voice grows out of a change in the anatomy of the vocal cords brought about by a fundamental change in the balance of power among the various ductless glands. The vocal cords thicken, and the voice eventually becomes lower. This process of readjustment is not entirely smooth and harmonious, as the hoarsely squeaking or unexpectedly failing voice of the adolescent boy testifies. Such a trait was not present at birth, but it is just as much determined by heredity as if it had been. Observation of boys who have grown up out of touch with other boys shows that even in such cases the characteristic voice change takes place at adolescence. It is not, therefore, something that is learned by imitation of other boys but is the result of maturation of structures. We are thus forced to expand our conception of hereditarily determined behavior to include that which is: (a) present at birth; (b) present later in all normal individuals of the species, even those reared in isolation who, consequently, had no opportunity to learn from others.

*Maturation in tadpoles.* Because it is so difficult to control the conditions surrounding the development of human individuals, our best demonstrations of maturation must be taken from studies of the development of animal behavior. A striking verification of the fact that behavior patterns can emerge in practically complete utility with very little previous stimulation or learning has been made by the embryologist Harrison<sup>12</sup> and more recently by the psychologist Carmichael.<sup>13</sup> Frog eggs were removed from their jelly-like coating and placed in a solution of chloretone, an anesthetic which stops all responses to stimuli but does not interfere with normal growth. A control group were kept under the same conditions of temperature and light as was the experimental group but were allowed to swim freely in pure water.

Note that the animals which were kept in the anesthetic could develop through maturation but not through learning, since stimulation is essential to learning.

These tadpoles were in effect developing in a psychological vacuum. The normal, or control, group, however, were exposed to the joint influences of maturation and stimulation. The question is this: In tadpoles do the behavior patterns involved in

swimming arise through maturation alone (are they native?), or must some practice occur to bring them to a point of perfection? When the normal animals—those exposed to both maturation and stimulation—had reached the stage of free swimming, the experimental individuals were lifted from their anesthetic solution and placed in pure water. When allowance (shown by experimental determinations to be fair) was made for the time required to “thaw out” of the anesthetic, it was seen that the experimental tadpoles swam just as well as the normals. Thus we conclude that the ability of tadpoles to make swimming movements is one that develops through maturation in the absence of stimulation prior to the test period.

*Maturation in rats.* It is instructive to examine another case in which a behavior pattern is not functional at birth but matures later in the absence of opportunity to learn. Stone reared male rats in isolation until the age of sexual maturity.<sup>14</sup> Until the day they were to be tested for the presence of instinctive behavior, they had never seen another animal. When of the age at which normal rats have reached full sexual maturity as indicated by their engaging in mating behavior, the males reared in isolation were placed in cages with sexually receptive females, which had had previous sexual experience. Almost immediately the isolated males engaged the females in typical mating behavior. The observer was unable to notice any important differences between the normal and the isolated groups of rats.

*Maturation in human beings.* We cannot rear a human infant in a psychological vacuum, for some external stimulation is necessary to the maintenance of life—food must be taken, air must be breathed, people must be near. It is possible, though, to isolate the developing individual from certain parts of the environment. Experiments of this type prove the validity of the concept of maturation as a factor contributing to the growth in complexity of human behavior.

Hilgard conducted such an experiment.<sup>15</sup> She kept one group of infants, twenty-four to thirty-six months old, away from any opportunity to learn to climb a ladder. This we shall call the *isolated group*, because they were reared in isolation from any experience with ladders. Of course they practiced other habits, such as walk-

ing, which has something in common with ladder climbing in that both involve the sense of balance and muscular strength. The other group made up of comparable children were given extensive practice in the specific motor skills of ladder climbing. This *practiced group* were allowed to climb a two and one half foot ladder to a table containing interesting toys. The toys were varied frequently so that their novelty would serve as a potent motive for climbing the ladder. This experiment ran from December 2 to April 3. The practiced group received a total of twelve weeks of practice at ladder climbing. The isolated group, on the other hand, were given only one week of practice, and that at the very end of the experiment. At the beginning of this week the isolated group was inferior to the practiced group, but by the end of the week *the isolated group had caught up with the practiced group*.

The point of this experiment is clear. When two individuals or groups of individuals are equal in degree of maturation, but one individual or group of individuals has had insufficient opportunity to learn, that individual or group will lag behind the other in quality of performance. However, if it is given opportunity later the differences will soon disappear, even though the other group has had a larger *total* amount of practice. At different stages of maturation, differing amounts of practice are required to achieve a given level of performance. The greater the maturity, ✓ the less practice needed. Just how long the opportunity to learn can be withheld without producing a permanent loss in capacity to respond to training is not known.

Strayer has shown that even in the case of language, a highly complex and socially significant type of behavior, the same fundamental observation holds true.<sup>16</sup> The two members of an identical twin pair were used as subjects. At the age of 84 weeks each was completely isolated from the other and from the social group. Twin T was given very intensive vocabulary training for a period of five weeks. This training consisted in showing the child objects and getting her to name them. If she failed, she was corrected. To make certain that the child was actually reacting to the objects themselves, she was given directions to pick up certain ones named by the teacher. Twin C was treated quite differently during this period. She was carefully isolated from any opportunity



to acquire language. Words were not spoken in her presence. The persons who took care of her were careful not to speak even to one another in her presence. For a period of four weeks this child was completely isolated from all language influences. At the end of the four-week period the isolated twin was given the same amount and type of training that Twin T had received earlier. It was found that Twin C, who was by now, of course, more mature than her mate had been at the start of her training, profited more quickly from the same amount and kind of practice. Twin C, in fact, began to acquire new words earlier in the training period and had on each corresponding day of her training period a vocabulary greater than that of her twin. Twin C's vocabulary at the end of 28 days of training was greater by seven words than that of Twin T (the earlier-trained one). Although training can speed the growth of vocabulary, it cannot transcend the limits imposed by maturation.

W. and M. G. Dennis have reported an observation which indicates that learning is only a small factor in determining age of onset of walking in Hopi children.<sup>17</sup> The Hopi Indians have a custom of placing their infants in a device which restrains movement. Not all mothers follow this tribal custom. It is possible, therefore, to find groups of babies that have not been restrained. Careful observations show that both groups begin to walk at the same time. The onset of walking is a slow process because maturation is slow. If learning were the big factor, the unrestrained group should walk earlier than the restrained, who have had much less practice.

An experiment which has attracted nation-wide attention is still under way. In 1932 Johnny and Jimmy, non-identical twins (p. 41), became subjects of an intensive study of behavior development.<sup>18</sup> From the twentieth day after birth, they were subjected to enormously different environments. Johnny was stimulated daily to engage in activities to the fullest extent of his capabilities. He was given little help in overcoming obstacles. Jimmy, at regular intervals, was taken into the laboratory so that his behavior could be observed under conditions similar to those Johnny was experiencing daily. Except for these periodic examination days, however, Jimmy played unhindered and with no special stimulation. Although somewhat inferior in physique at birth,

Johnny could, at nineteen months, roller-skate skilfully, swim, and drop from a five-foot perch—acts which Jimmy would not even attempt. At twenty-two months Jimmy was given a period of two and one half months of intensive practice in the same activities Johnny had had. In some activities, such as learning to ride a tricycle, Jimmy accomplished an easy performance in a shorter time. And it is interesting to note that both took a few steps alone when 269 days old, *although Johnny had had practice in stepping movements from twenty days*. But Jimmy's timidity and lack of self-reliance handicapped him in such activities as jumping and ascending steep inclines. Johnny was consistently superior to Jimmy in *muscular coördination*.

At the end of the training period they were returned to their home. In the meantime they have been examined in these same performances at intervals varying from six weeks to two months. When they were six years of age their behavior development was reported in a systematic study by McGraw.<sup>19</sup> At this time Johnny, who received the longer and more intensive practice in motor

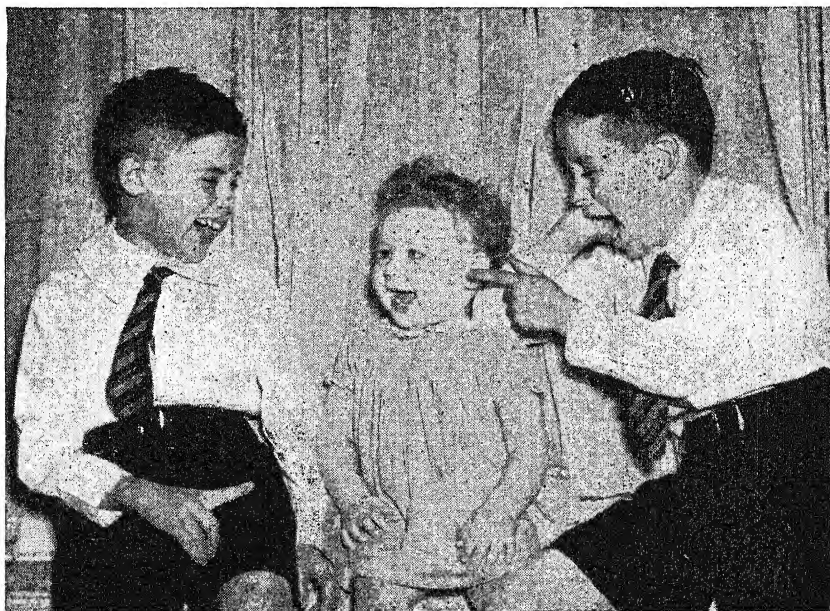


FIGURE 8. *The much-studied Woods twins, Jimmy (right) and Johnny, at the age of eight seem to get equal pleasure with their eighteen months' old sister Jane.*

activities, manifested greater motor coördination and daring in physical performances. Jimmy, who was more awkward and timid, exercised elaborate and devious methods of making the motor aspect of a given activity easier. McGraw believes that in terms of final accomplishment the two children may end up with the same characteristics. As far as is known, they have had little or no practice in tricycling or skating at home or in play-yards. At the time of the study just mentioned neither showed a distinct loss in skill in tricycling, but neither skated well nor climbed inclines well. Apparently the effects of intensive training in the more complex skills are soon lost when training is stopped.

The boys present quite different pictures in personality development. Jimmy, who had less of an adjustment to make at home, lives for the moment. Johnny is more serious. As for intelligence, both are within the normal range as measured by standardized tests.

*Individuals differ in the rate and level of maturation.* Individuals do not mature at the same rate. Superior children will constantly increase their margin of superiority over average children of their own age. Backward children, on the other hand, drop further and further behind.

Clearly in a large group of individuals of the same chronological age some will be more mature than others. If we have them all practice some task until practice brings no further improvement, we observe that with some persons this is at a high degree of skill, while with others it is at a low point of mastery. We discover also that certain individuals reach this level of skill sooner, i.e., with less practice. The individuals have arranged themselves in a certain order of ability which no amount of further practice will change materially.<sup>20</sup>

25981  
The status of our maturation determines and limits our capacity to profit from our environment—our capacity to learn. Capacity is not the same as performance, although performance is the only criterion of capacity. This statement might seem paradoxical if left undeveloped. In everyday thinking we talk of capacity and performance in terms of one another. An exact statement of the relationship between capacity and performance includes another factor, practice. Performance is the product of innate capacity (de-

gree of maturation) and practice. Knowing two of these, we are able to infer the third. For example:

A performs better than B.  
A and B have had the same amount of practice.  
Therefore, A has more innate capacity than B.

A and B perform equally well.  
A has had more practice than B.  
Therefore, A has less capacity than B.

A has more capacity than B.  
A and B have had the same amount of practice.  
Therefore, A performs better than B.

We must assume for the sake of simplicity that A and B have the same interest in performing well—that motivation (p. 63) is the same.

The relative importance of the part practice plays in determining an individual's performance will depend closely upon the nature of the task. In the tadpole experiment we found that the animals which had had no practice whatever were able to swim, when given the chance, just as well as those who had had the normal amount of prior practice. This means that swimming performance in the tadpole is almost 100 per cent innate capacity and that any individual differences in swimming ability in tadpoles (they are there if we look hard enough with accurate measuring instruments) are completely determined by inherited constitution. This is an extreme case of the effect of maturation, for here differences in the amount of practice have almost no effect in producing individual differences.

Now let us take a case at the other extreme, one involving men. Ability to pitch horseshoes requires an enormous amount of practice. Even men who have played several times a week for a number of years will still show some improvement after further practice. Here, we are likely to say, is a learned task. That is in a sense true. Learning is very important, but *learning is not the whole story* even in the game of horseshoes. Give a group of would-be

horseshoe players the same amount of practice, and you will find that some are better than others. Those who are better must have more capacity for pitching horseshoes. The point is that the practice period is necessarily so long even for the best player that we think of skill in this game as essentially learned. Between these two cases there are many of intermediate degree.

The foregoing examples drawn from animal and human development contribute greatly to our understanding of why individuals differ or do not differ. They may all be summarized in the following statements, which apply to all phases of human development.

For any individual there is a limit set by maturation to the degree of perfection he can attain in any given activity.

When two persons differ in the amount of opportunity to learn or in the degree to which they have taken advantage of such opportunities, they will be different in their performances and personalities even though they are identical in their maturational status.

When two persons have had the same amount of practice but are not identical in maturational status, they will differ from each other in performance.

Differences between persons of identical maturational status brought about by differences in practice will be greatly reduced or will even disappear when the under-practiced individual is permitted to make up for his lack of opportunity.

Differences among people who have had a large amount of opportunity to learn are due to differences in maturation and will be relatively permanent.

The amount of learning time required to attain the limit set by maturation also differs widely among the members of any species. In general, the individuals who improve most rapidly between two common points of mastery of the particular skill in question reach their ultimate level of performance at a higher point.

Present indications are that a given individual's maturational status is not equally high for all skills. This complex issue will be discussed in more detail in Chapter 12.

Psychologists have discovered many times that few individuals reach the very peak of performance possible within the limitations

of their maturational status. Most human beings are content to come to rest at some point below their maximum potential performance. Exceptions will be found in the cases of outstanding musicians and champions among athletes. Such individuals have devoted enormous periods of practice to reaching their peak of performance and are of high maturational status for their particular skills.

*The effects of equal practice on individual differences.* It is of great social importance to know whether practice makes individuals more or less alike. If practice reduces individual differences, the person of mediocre ability can expect to catch up part way at least, if he works hard enough. If, on the other hand, training puts individuals farther apart in ability, then it is extremely important that individuals selected to perform socially important skills be ones of greatest initial capacity.

Anastasi performed an extensive experiment in which one to two hundred college students practiced one of four kinds of tasks:<sup>21</sup>

(1) *A*—cancellation in which the subject marked out every *A* in lines of pided type.

(2) Symbol-digit code learning in which lists of symbols were given numbers according to a prearranged code.

(3) Hidden words in which the subjects found words in lines of pided type.

(4) Vocabulary learning in which subjects learned nonsense syllables.

The subjects were different in their initial performance partly because of differences in prior opportunity to learn and partly because of differences in maturational status.

The differences among these individuals were increased by practice in all four learning situations.

Numerous experiments show that individual differences are increased even more by the forgetting which follows a period of training.

Divergence of individuals in performance under conditions of equal practice is greatest in performances which are mainly a matter of inherited underlying capacity. Differences due mainly to environmental effects are usually reduced under conditions of equal practice. For example, boys are usually better than girls in taking

apart or putting together of mechanical gadgets. Given a little practice the average girl becomes as good as the average boy at this type of performance.

*The instinct controversy.* Gallons of printer's ink have been spilled in futile controversy over the concept of instinct. Are there instincts? Psychologists, educators, and philosophers have taken sides, some saying "yes," some saying "no." The Yes's drew up lists of instincts ranging in length from one to forty, while the No's objected to the whole concept.

As in most controversies, the root of the difficulty lay in the failure to define terms. Instinct, in the sense of a behavior pattern which is from a given moment completely matured and ready to function upon the first occasion the adequate stimulus situation is presented and without further modification through learning, is very rare in man. In this respect man seems to differ from animals. We have seen that sex behavior in rats is adequate in the absence of opportunity to learn. We also have the Harrison and Carmichael experiments with the tadpoles. But obviously instinct in the sense of capacity is important in human as well as animal psychology. Although the concept of instinct as an all-or-none pattern is not valuable in explaining and describing human behavior, the idea of capacity as it has been presented in this section is fundamental. Because of the misunderstanding still aroused when the word instinct is used, most psychologists prefer to employ some other term.

*Maturation throughout life.* Maturation follows a positive course from conception to some point which we can call the prime of life. The exact age at which maximum development is attained depends upon the nature of the behavior under consideration. Simple performances attain their maximum early in life; complex performances grow more slowly. A young child walks about as well as he ever can, but his ability to talk, as measured by the size of his vocabulary, increases fairly steadily until middle age.

Beyond the point of prime, increases in age seem to bring about losses in ability to profit from opportunity to learn. Between the ages of twenty and forty-five or fifty years these losses are not important. As the individual enters into the period of old age, however, learning becomes more and more difficult. The loss of



learning ability also depends upon what is to be learned. The details of this interesting problem must be saved for a later chapter.

### *Heredity and Maturation*

**R**ATE OF MATURATION is one of the many qualities of a person that are determined by heredity. By heredity we mean the determination of the characteristics of the individual by the germ plasm received from the parents. The study of the structures and chemical reactions which constitute the physical basis of heredity falls within the boundaries of biology. For the study of psychology, you must, nevertheless, have some familiarity with the essentials of the picture. (For a more detailed study consult the reference books suggested at the end of this chapter.)

Within the living germ cells which unite at the moment of conception to produce an individual are found a number of tiny rod-like structures which are called "chromosomes." The term "chromosome" (color body) is applied to these bodies, because they stain darkly when treated with certain chemicals.

Many lines of evidence converge to show us that these structures play a very important (almost an all-important) rôle as bearers of hereditary traits. They are the materials which steer the development of structure as the fertilized ovum unfolds into an individual organism. How this is done is still something of a mystery. In each of the chromosomes are still smaller parts called "genes." Each gene carries a unit factor of heredity. That is to say, each gene is composed of some substance or contains some structure absolutely necessary to the development of a particular

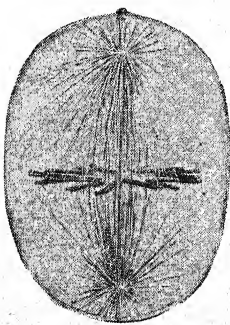
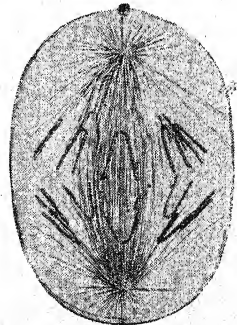


FIGURE 9. In these models of a living animal cell in the process of dividing, the dark-colored figures are the chromosomes; they bear the genes through which traits are inherited from one's parents. (The two spindle-shaped masses are the centrosome—"center body.")



trait of structure or behavior. The whole heredity of the individual consists of many traits, each determined by a gene, a pair of genes, or a group of genes.

Half of the individual's genes come from the mother and half from the father. Thus we would expect children to resemble their mothers as closely as they resemble their fathers in inherited traits. Numerous measurements show that this is usually the case. And, interestingly enough, the degree of resemblance between mother and son is generally as great as that between mother and daughter. A similar situation exists in the case of father and child comparisons. But there are certain exceptions; for example, color-blindness is inherited mainly from the mother, although it shows up more frequently in her sons than in her daughters.

In the lower organisms, plants especially, it is possible to determine by carefully conducted experiments the exact chromosome and gene involved in the hereditary transmission of a particular trait. In man, however, the situation is so complex that we have very little hope of accomplishing a similar result. Whereas in the lower animals certain traits seem to be unitary, that is, determined by a single gene, most human traits are apparently determined by a large number of genes.

### *Resemblances and differences among relatives*

Curiously, the power of heredity in determining an individual's characteristics is shown both by the resemblances between relatives and by the differences. This apparent discrepancy grows out of the fact that two children of the same parents can receive different particular sets of genes, though always receiving half from each parent. For our purpose it is enough to know that brothers and sisters or other relatives are more likely to receive the same genes than are unrelated individuals but that brothers and sisters, unless they are identical twins, rarely receive exactly equivalent sets of genes. Identical twins are individuals both of whom develop from the same single fertilized egg; thus they always receive exactly equivalent sets of genes and are always of the same sex.

### *Dominance and recessiveness*

That heredity can produce differences as well as resemblances

among the members of a family is due in part to an interesting relationship among genes called dominance, which can be illustrated by reference to the inheritance of a condition known as taste-blindness. A certain chemical substance tastes bitter to about seventy per cent of all people. The other thirty per cent cannot taste it at all. The best evidence indicates that a person's ability or lack of ability to taste it is inherited and is dependent upon the possession of two genes, one from each parent. If both of these genes are "non-taster" genes, the individual will not be able to taste the bitter chemical, but if both of the genes are "tasters," the individual will be able to taste it. A person who receives one taster and one non-taster gene will be able to taste the substance, since the taster gene is *dominant* over the non-taster. That is, the condition of taste-blindness is *recessive*. Now suppose that this person marries another with exactly the same kind of genes. Their children will include some who cannot taste the chemical substance and some who can. Here you see how heredity produces a difference as well as a resemblance between parents and children. At the present time we do not know exactly how many cases of dominance occur in the human being, since dominance can be identified easily only when the corresponding recessive trait in question is quite rare in the adult population.<sup>22</sup> Many traits, however, are known to be dominant. Among these are some types of cancer of the skin and brain; allergy; migraine; drooping eyelids; cataracts; certain muscular troubles; white forelock, or "blaze"; baldness; and dwarfism.

There are about a dozen recessive conditions similar to taste-blindness, including among others a rare type of complete color-blindness; some types of visual and hearing defects; certain kinds of paralysis; albinism ("dead white" skin with pink eyes and white hair); diabetes or "sugar sickness"; probably certain types of insanity; and one fairly rare type of feeble-mindedness known as amaurotic family idiocy. If two parents produce an amaurotic idiot child, the odds are that one half of its brothers and sisters will carry the gene and that one fourth of them will show the trait in question. Even though we were to sterilize every case of idiocy of this type, it would probably take several centuries to reduce the condition to half of its present frequency.

Although maturation is not an obvious thing like color-blind-

ness, albinism, and taste-blindness, the rate at and extent to which one matures is evidently inherited. The details of the proof of this are so complicated that we should accept this statement only as a working principle subject to revision. The relative importance of maturation in our behavior varies with the type of behavior. For example, heredity-maturation is quite important in determining the rate at which intelligence grows and the final level it attains but is much less important in determining morality and character.

### *Bodily Structures Mature*

WE HAVE SEEN that maturation explains the greater effectiveness of practice coming later in life, but not too late, as compared to that of the same amount imposed at an earlier age. In this section we shall see how this maturation of structures underlying behavior takes place with age. The student must always keep in mind that every behavior pattern has its underlying pattern of receptor-muscle or receptor-gland connections.

Three kinds of structures in the organism which show maturation and are of first interest to the psychologist are (1) muscles, (2) nervous tissue, and (3) endocrine glands.

#### *Maturation of muscles*

In certain instances the failure of an organism to exhibit a pattern of behavior which will come later can be explained on the basis of a lack of sufficient maturity of the muscles. With maturity comes strength, and strength is essential to the performance of certain response patterns. The three-day-old human infant cannot walk because his muscles are too weak to support the weight of his body. That the nervous and muscular elements of the reaction system are otherwise at least partially functional is shown by the fact that the three-day-old can execute pretty fair walking movements if the weight of his body is supported by some outside agency.

The increased strength of muscles as the organism grows is a result of the increase in size which maturation brings. It should not be thought that maturation is the only factor determining

The endocrine system, like any other bodily structure, is determined by heredity. Response of the ductless glands can be changed through conditioning, however, a fact which has great importance for the understanding of the growth of emotional behavior.

*The pituitary glands.* There is a small body attached to the underside of the brain and lying right in the center of the head which is called the *pituitary body*. This organ is divided into two parts, the anterior and the posterior pituitary glands. The anterior pituitary controls bodily growth, activates the sexual functions, and, apparently, plays a part in the maturation of intelligence. If this gland is overactive during childhood, growth will progress at a great rate, and a true giant will result. Such a giant can reach the height of as much as nine feet. He may give the appearance of strength but is usually much weaker muscularly than the average man. It usually happens that the anterior lobe of the pituitary body declines in function after a period of overactivity, leaving the person with a huge bulk but with flabby muscles which are inadequate to the execution of the simplest tasks. These giants are typically weak in sexual drive at this stage. When early treatment has been neglected, about the only thing left for the giant of this type to do is place himself on exhibit at a circus side show or in a medical museum.

Fortunately modern surgery has developed a method of operating to remove some of the excess glandular substance and thus prevent the unfortunate condition of giantism. This aid was refused, however, by the individual whose life story is highlighted by the following newspaper accounts.

*Illinois Youth Is 8 Feet, 6 Inches Tall, Weighs 435 Pounds at 19*

By FRED R. COPELAND

United Press Staff Correspondent

ALTON, ILL., Feb. 22, 1937—(UP)—Robert Wadlow, whom medical science has judged the tallest man in history, celebrated his 19th birthday today with 2 more inches and two score pounds added to his frame.

Robert is creeping up beyond the 8-foot 6-inch mark compared to an 8-foot 4 when he blew out the candles on his cake last Feb. 22. And he has put on an additional 40 pounds which brings his weight to 435.

The boy Brobdingnagian was a normal-sized baby at birth, weighing 8½ pounds, but an overzealous pituitary gland caused him to soar upward

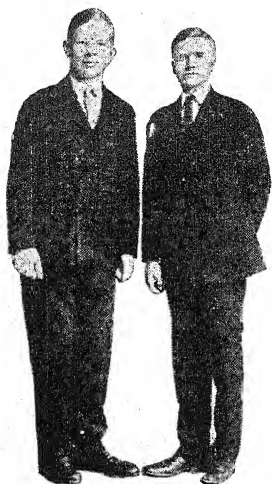


FIGURE 11. Robert Wadlow—with his father—as he looked at the age of nine (above) and a few months before his death at the age of 22.



at a rapid rate. The pituitary, a small ductless gland at the base of the skull, sometimes continues to function abnormally until the giant reaches the age of 24. Robert grows at the rate of 2 inches a year.

When interviewed at his home, Robert answered the door. The first impression was a belt buckle surrounded by a great expanse of shirt and trousers. Then above the transom his face smiled down from behind gold-rimmed spectacles.

Nature provided a good foundation for Robert's lengthy frame. He wears size 36 shoes—which, he said, are beginning to pinch. The cost is \$90 a pair every time a new last is necessary.

His parents, Mr. and Mrs. Harold Wadlow, and his brothers and sisters, Helen, 17, Betty, 12, Eugene, 14, and Harold Jr., 4, are of normal size.

At present Robert is unoccupied, having just returned from Chicago where he did advertising work in department stores.

He likes to travel and does a good deal of it by plane. He doesn't care much for automobiles because his knees are always knocking his hat off.

An auto trailer wouldn't be bad, he admitted thoughtfully, providing he could take along his favorite chair which has a seat the size of an office desk and is every bit as high.

Circus tall men have no desire to follow their shows into Alton, because he often steals their act. Even at the age of ten he claims he caused many side-show blushes.

His present ambition is to become a

lawyer, and, now that he has decided against resuming his work in advertising, he plans to return to college next semester. His hobby is photography. He develops and enlarges his own pictures.

Despite his bulk the youth is not exceptionally strong, which is the reason he has not been able to capitalize on his height in sports. For a time basketball held his attention.

"But it's too easy. I'd stand down near the net, someone would throw me the ball and I'd drop it in." He was thoughtful a moment, then added, "I don't think the other teams liked it much."

### *Robert Wadlow Dies; Tallest Man in World*

*(Chicago Daily News, July 15, 1940.)*

Alton Giant, 22, Measured 8 Feet 9½ Inches and Weighed 491 Pounds.

Death today ended both the career and the amazing growth of Robert Pershing Wadlow, the tallest man known to medical history.

Wadlow, who was 8 feet 9½ inches tall and who weighed 491 pounds, succumbed to an infection early today in Manistee, Mich., where he was appearing in a festival.

He was a familiar figure to Chicagoans, having made numerous appearances here with circuses as "the world's tallest man" and also for various local firms as an advertising stunt. His great hulk as he walked about the city's streets never failed to gain awesome attention.

### GROWTH AMAZES WORLD

Wadlow, whose home was in Alton, Ill., was 22 years old last Feb. 22. Although weighing a normal eight and one half pounds when he was born, his phenomenal growth never ceased from his birth. Since his last birthday he had added an inch to his height. Physicians who examined him then had predicted he would attain nine feet before he stopped growing.

Scientists classified him as an "acromegalic type," designating a person whose growth has been abnormal because of overactivity of the pituitary, the gland at the base of the brain.

When he was six months old Wadlow weighed 30 pounds, but his unusual growth was not observed until, at 18 months, he tipped the scale at 62 pounds. By the time he was of kindergarten age, he was wearing clothes designed for a youth in his teens. In a few years, he was wearing garments made for large men, and ordinary furniture would not support his weight.



## SIZE 39 SHOES COST \$86

In recent years all his clothes were made to order, even his pocket handkerchiefs and neckties, with nine yards of material being required to make a suit for him. His shoes, size 39, cost \$86 a pair.

A special cap and gown were made for him when he was graduated from Alton High School in January, 1936. He was then 8 feet 4 inches tall, and the gown measured 92 inches from collar to hem, 51 inches around the chest and 55 inches in sleeve length.

Wadlow had been a good student and was awarded a scholarship to Shurtleff College, Alton. He had intended to prepare for law, but attended Shurtleff only one year, leaving to become a salesman for a shoe firm and to make appearances with shows.

## SQUEEZES INTO POLLING BOOTH

Shortly after his 21st birthday, when the Alton De Molay chapter, to which he belonged, gave him a party with an ox-wheel size cake, Wadlow voted for the first time in a municipal election, squeezing into an ordinary size polling booth, but holding his ballot near the ceiling as he marked it.

Last year Wadlow lost a \$100,000 damage suit in St. Joseph, Mo., against a physician who had written an article about the "giant" in the Journal of the American Medical Association. In May a similar suit against a weekly news magazine likewise resulted in a verdict against him.

Wadlow's parents, as well as two sisters and two brothers, are all of normal size. His death was the result of an infection in his left ankle, caused by chafe from a brace, suffered about two weeks ago.

When excessive activity of the anterior lobe of the pituitary gland starts later in life, the individual develops a condition known as *acromegaly*. In acromegaly there is overgrowth of certain portions of the skeleton. In a typical case the hands become greatly enlarged and show deeply corrugated palms, the arms lengthen until the fingers reach the level of the knees, the jaw-bone becomes large and heavy, forcing a separation of the teeth, which do not change in size. The diameter of the chest is greatly increased, and the spinal column assumes a marked bow. The bent back, the barrel-like chest, the huge, furrowed, dangling, ham-like hands, and the massive jaw set with widely separated teeth suggest the descriptive but unscientific term "gorilla man."

The secretion of the anterior lobe of the pituitary is responsible

also for secondary effects brought about through stimulation of other ductless glands, particularly the adrenal glands and the sex glands. Thus on the behavior side of acromegaly we can expect to see an increase in the strength of the sex drive which lasts as long as the anterior lobe of the pituitary gland remains hyperactive. Eventually, however, there is failure of glandular function in acromegaly as in giantism. This failure of function is followed by loss of sexual drive and by the deposit of vast quantities of fat below the skin, especially around the middle of the body. Gradually increasing weakness is observed in the untreated patient, who dies relatively young.

In many instances the condition of acromegaly is accompanied by various symptoms of mental disease. It is usually impossible to tell whether these mental symptoms are produced by the over-secretion of the gland or whether symptoms and over-secretion are both produced by irritation elsewhere.

Underactivity of the anterior lobe of the pituitary gland if long continued during the period of childhood will produce a dwarf. The midgets that you see in the circus are usually of this sort. This dwarfism can be prevented or alleviated if pituitary extracts are administered under the direction of a doctor during what is normally the growing period.

Many cases of underactivity of the anterior portion of the pituitary gland show a history of behavior problems such as outbursts of temper, irritability, and various types of antisocial conduct commonly known as "plain ornery." Individuals who have underactive pituitaries frequently show subnormal intelligence.

Little is known of the function of the posterior pituitary except that it has a strong influence upon the ability of the body to burn fatty substances. Underactivity of this gland frequently gives rise to the condition of extreme fatness which medical people call obesity. The professional fat man or fat woman of the circus side show is often a case of underactivity of the posterior pituitary gland.

*The adrenal glands.* There are two *adrenal glands*. They are located near the kidneys and are for that reason sometimes called the "suprarenal bodies." Each consists of an inner core, the *medulla*, and an outer layer, the *cortex*. During emotion there is a

secretion from the medulla called *adrenin*, which brings about the vast internal changes to be described in Chapter 4.

The secretion of the outer layer or cortex is called *cortin*, which, if present in excessive amounts, produces a heightened activity of the body and an accentuation of masculine physical and behavior traits such as growth of beard and masculine sex interests. This condition of *virilism* may occur in people of either sex. Such a state is, of course, more easily recognized in women. The "bearded lady" of the side show is either a fake or a case of virilism due to a too-active adrenal cortex. Without cortin the blood circulates poorly, the individual loses sex interest, becomes weak and flabby, and dies prematurely. These latter effects have long been known to medicine through observation of cases of *Addison's disease*, in which the adrenal cortex is destroyed.

*The sex glands, or gonads.* In addition to the supplying of germ cells in procreation, the reproductive tissues of both the male and female through their glandular tissues provide important secretions to the blood stream. The effects of these gonadal secretions differ greatly with the sex of the individual.

The substance produced by the primary female organs or ovaries is called *theelin*. This substance is one of several which steer the development and behavior in the direction of femininity. The substance produced by the male primary tissues or testes has not been given a special name as yet, but its functions are well known. This secretion steers development of structure and personality in the direction of masculinity. Sollenberger has shown that the secretion of the male sex glands hastens maturation in boys.<sup>24</sup> When this substance is absent, the boy fails to develop the beard and deep voice which should come with adolescence. The male or female from whom the sexual glands have been removed develops into a sort of inter-sex which is attracted neither to nor by either men or women. Experiments with chickens and rats have shown that transplantation of the male sex glands into females from whom the ovaries have been removed will cause complete reversal of sexual behavior. The females thus treated behave in the manner typical of the male.

*The thyroids.* The *thyroid glands* are located in the neck at either side of the "adam's apple." They influence the development

of intelligence, as will be seen in Chapter 13 and exercise control over the rate of metabolism in the body. Individuals having low metabolism due to insufficient thyroid secretion tend to become fat and sleepy. Those with too much thyroid secretion become irritable and thin, and frequently have trouble sleeping. Inadequate thyroid secretion during childhood causes delay in physical development and the attainment of sexual maturity.

*The thymus gland.* The *thymus gland*, found in the neck, seems to be of importance mainly in that it opposes the effects of the sex glands. The thymus gland is large in the young and sexually immature child, but becomes smaller at the age of puberty, and finally disappears almost completely in the sexually mature adult.

*The balance of power in the endocrine gland system.* The whole picture of the endocrine system strongly suggests the world pattern of political interaction. There are allies as well as antagonists among the endocrine glands. Sometimes the balance of power among the nations of the world is destroyed by one set of allies becoming too strong; sometimes the balance of power in the endocrine system is destroyed in analogous fashion. As stated earlier, cortin in the male augments the effects of the gonadal secretions; excessive thyroid secretion in either sex appears to increase the sexual drive. The anterior pituitary secretion acts as a stimulant to the thyroid, the adrenal cortex, and the sex glands.

As men and women grow old, their gonadal tissues undergo atrophy or loss of function. The effects of this decline of the gonadal glands are especially noticeable in women who have passed the change of life. The adrenal cortex is no longer so vigorously opposed by the gonads, and in consequence the beard may start to grow more vigorously and the skin will frequently lose the delicate texture characteristic of young women.



A baby's behavior is largely determined by heredity. Even at birth his repertoire of behavior is fairly extensive. He responds to sound, light, touch, and pain. After birth, learning becomes increasingly important. Differences between people are produced by differences in the amount and kind of opportunity they have had and by the quality of their inherited structure. Maturation is

a growth process whereby the capacity of an individual to profit from opportunity to learn changes with age. Individuals of the same age may differ in maturational status. Maturation sets the limit to the effectiveness of environment, particularly in the case of learning. Maturation takes place in all of the bodily structures, but that of the ductless-gland system and of the nervous system seems to be most intimately connected with behavior.

### *Recommended Readings*

ALLEN, E., DANFORTH, C. H., and DOISY, E. A. (Editors). *Sex and Internal Secretions*. William Wood & Company, 1939.

Twenty-five authorities present the latest experimental evidence on the endocrinology of sexual function.

ANASTASI, ANNE. *Differential Psychology; individual and group differences in behavior*. The Macmillan Company, 1937.

A comprehensive review and discussion of experiments shedding light on the factors that make us alike or not alike.

COLLIP, J. B. *Hormones in Relation to Human Behavior*. In *Factors Determining Human Behavior*. Harvard University Press, 1937.

A discussion of the rôle of endocrine gland secretions and their relation to heredity and environment.

GESELL, ARNOLD, *et al.* *The First Five Years of Life*. Harper & Brothers, 1940.

This book represents the results of fifteen years of study at the Yale Clinic of Child Development.

GILLILAND, A. R., and CLARK, E. L. *Psychology of Individual Differences*. Prentice-Hall, 1939.

Get acquainted with Chapters 2, 4, 7, and 11 of this substantial book at this time.

JERSILD, A. T. *Child Psychology*. (Revised Edition.) Prentice-Hall, 1940.

The original is good; the revision is better.

SCHEINFELD, AMRAM, and SCHWEITZER, M. D. *You and Heredity*. Frederick A. Stokes Company, 1939.

At last an authoritative treatise on human heredity that the intelligent layman can understand and will read with interest.

PART TWO

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*Inner Springs  
of Action*







*"The noblest motive is the public good."* . VIRGIL

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### CHAPTER 3

## MOTIVATION

*Drives and motives (the things that make us go and stop) are biological and social. The social motives—of which the desire for social approval is the most important—are built upon physiological drives present at birth.*

PSYCHOLOGY is interested in the accurate description of human behavior so that we may predict how people will behave and so that eventually we can learn to control human behavior. Controlling human behavior consists in arranging conditions in such a way that people will do the things you want them to do. If we wish ultimately to control the behavior of others, it is essential that we study the conditions underlying human motivation in so far as science has been able to determine them.

What makes you search for food, water, or a place to rest? Why do you get out of bed when the alarm clock rings? Would you be as happy under a dictator as in a democracy? Why do some men obey the law, while others defy it? Some men energetically apply themselves to their work; others prefer to loaf. Why? Some persons

think always of themselves; others are happy only when serving mankind. Why is this? These are problems of motivation. An understanding of human motives is necessary for a happy family life, invaluable in business, and part of the stock of the effective leader; without such an understanding we cannot efficiently sell goods, prevent wars, appraise one form of government in relation to another, or plan an economic system that will not be subject to periods of inflation and deflation, of boom and depression. There are problems of motivation in everything we do; accordingly the concepts discussed in this chapter are essential to an understanding of everything to come in the following chapters of this book.

All behavior is motivated, although we are not always conscious of the motives which guide our behavior; even in the most deliberate of voluntary acts we are probably only rarely, if ever, aware of all the forces at work within us impelling us toward and away from that course of action.

### *Motivation and Ability*

**I**N ORDER to understand why an individual fails or succeeds at some task which confronts him, we must know two things: (1) how much ability he has for the task in question and (2) how strongly motivated he is. Failure may be due to lack of ability or to lack of motivation. Success, on the other hand, requires a high degree of motivation working with a high degree of ability. In everyday situations the measure of motivation is the amount of time and effort which the individual will devote to the activity in question. A pianist, for example, must practice from six to eight hours every day to become truly great. Even with such work, success will be gained only if the individual also has great inborn ability.

Let us take another example, one which is familiar to all college students. You probably know some students who get fairly good grades despite a minimum of time and effort devoted to study. You probably know other individuals who study hard and still get only average grades. Why is this? Again we turn to the psychology of motivation for our explanation. The relationship between ability and motivation is what the mathematicians call a reciprocal

one. It is compensatory in nature. A low degree of ability can be compensated for by a high degree of motivation, and vice versa. Here too, however, the best performance requires both high motivation and outstanding ability.

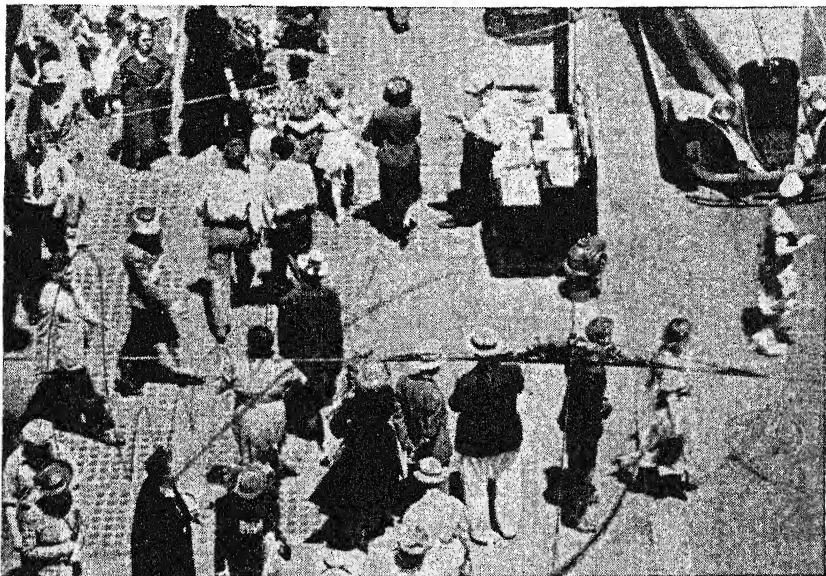


FIGURE 12. *On this street corner are thirty-one individuals with different abilities and motivations. Where they came from, where they are going, and why—these are questions of as much interest to you as to them.*

In later chapters we will resume the study of the factor of ability. Just now we are interested in motivation, which determines the *direction* of man's activities.

### *What Happens in Motivation*

WHEN we say an individual is motivated in such and such a way, what actually is happening, physiologically and psychologically, within the individual?

#### *Internal conditions which direct behavior*

In any activity there are certain internal conditions or forces without which there would be no activity. These internal conditions are capable of directing the organism toward certain goals, irrespective of whether those goals are, at the time, present to the

organism and will even propel the organism into different places or situations in search of the goal. For example, a winter-sports enthusiast who lives in a warm climate watches the weather reports of the northern states and leaves at a moment's notice upon learning of a heavy snowfall. His goal is actively pursued though it is not present to him in time and space.

Internal conditions also affect the individual's perception of those situations. Under the influence of one set of internal conditions, a certain portion of the environment will be perceived in relationship to one goal. If, however, another set of internal conditions is operating, that same part of the environment will be perceived in relationship to the behavior involved in attaining the second goal. Suppose, for example, that there is a book lying on the table. A person seated alone by a roaring fire after dinner might read the book. If, however, he were collecting botanical specimens, the book might be seized on as something in which to press flowers. Or perhaps he is looking for a gift to send, and his eye lights on the book. Or again perhaps the wind is rattling the door; the book is seen as a means to hold the door quiet.

### *Internal stimuli affect our reactions to external stimuli*

In studying motivation we study all the conditions which arouse and direct the behavior of organisms. In the preceding chapter you were introduced to one of psychology's fundamental postulates: that behavior is set off by stimuli. This is in no way contradicted by the present discussion, since the stimuli may be either external or internal. What the study of motivation does bring out forcibly is that behavior is not simple item-for-item reaction to external stimuli. Those stimuli arising within us are at least as important as any coming from the outside. Internal conditions can either initiate activity (as in hunger, thirst, etc.) or combine their effects with those of certain of the stimuli coming from the outside. By this latter process the response is frequently rendered out of all proportion to the strength of the external stimulus alone, which may appear to serve as nothing more than a trigger to set off a charge stored within the body.

A spoken or written word, for example, contains little energy measured in physical terms. It may, however, depending upon its

meaning, arouse terrific action on the part of the person who hears it spoken or sees it printed. Imagine seeing these headlines.

### MYSTERIOUS EPIDEMIC RAGES THOUSANDS DEAD; MORE DYING

Think how violent your response to such news would be. These seven words, when seen in large type across the front page of your morning paper, would involve a very small transfer of physical energy, but they would arouse reactions of enormous intensity in any reader of normal intelligence and emotions. The news would be exciting to some and stunning to others. The implications of such news for yourself and for your friends and relatives would be so vast that every other activity would be postponed until you had a chance to think it over and talk it over.

The headlines would raise more questions than they would solve. Who are these people who are dead or dying? What is responsible for the catastrophic epidemic? Will I be one of its victims? What can I do to protect myself and my community? Thus external stimuli are made effective by internal ones.

#### *Drives and motives*

These internal conditions which direct our responses to external stimuli are called "drives" and "motives." Our drives and motives determine which of two present stimuli we will react to as well as what stimuli we will look for when they are not present in our immediate environment.

The terms "drive" and "motive" are used interchangeably by some psychologists. Others, including the writer, restrict the term "drive" to stimulating conditions that go with some bodily need such as that for food, water, or air. These physiological drives are not learned but are a part of the inherited nature of the organism. When drives have an outlet—when the individual has learned what to do to obtain satisfaction of a bodily need—we call them motives.

Social "motives," on the other hand, include such forces as desire for approval, desire for wealth or power, and desire to help children and the weak. In the infant we see only strong physiological drives. As time goes on, however, the individual becomes

changed through learning. Activities which in the infant are aroused only by a strong physiological condition, such as hunger, thirst, or pain, will in the adult be aroused both by these physiological conditions and by symbols which have come to be associated with them.

## *The Physiological Drives and Motives*

The physiological drives and motives are basic and will be discussed first though they appear to have less direct bearing on our particular daily problems than do the social drives.

### *Hunger*

The hunger drive will serve as a good first example for several reasons. First, the food-taking responses are essential to life. Secondly, the development of the hunger drive is better understood than that of other physiological drives. And third, the hunger drive is at the same time essentially similar to the other drives in that it serves to direct behavior both by causing one external stimulus to win over competing ones and by causing the individual to seek external objects not at the time present to the senses.

*Hunger activity in infants.* We turn to the new-born to get a clear notion of how physiological drives operate before they have become symbolic and socialized, i.e., before they have become motives, for the behavior of a young baby is largely a result of heredity. Learning goes on in the new-born baby, perhaps even in the fetus, but there has not been time for much learning within the first few weeks of life. Food-taking responses are sufficiently mature in the new-born to function at a low level of organization.

When babies were put in an observation chamber with all external conditions held constant, it was noticed that they started at a very early date to show definite cycles of general activity.<sup>1</sup> The babies would sleep peacefully until just before feeding time, when they would become restless and often start to cry, even when they were dry and when no new external stimulus had been presented. The general activity would increase until feeding, after which the babies would become quiet and fall asleep.

A touch on any part of the face of a baby will often cause the

mouth to open and the lips to make sucking movements. If the touch is on the lips, these effects will be more pronounced. Furthermore a touch on a given region elicits sucking movements more frequently when the child is hungry than it does after the child has been fed. This is evidence of a patterned response in which the condition of the stomach is the important internal stimulus or determining condition—the motivating condition.

As the days pass, the rhythm of activity in the human baby becomes more and more pronounced. Another characteristic change is the development of more and more sharply defined food-taking responses. As the baby becomes older, his mouth movements become more coördinated and specific to stimuli afforded by the bottle or breast. Stimuli on the baby's lips become more closely tied to mouth-opening and sucking.

Hunger remains a very strong motive throughout childhood. In adulthood other motives, interests, and ambitions come to be so important that food-seeking no longer dominates the scene.

*What is the stimulus in hunger?* On the basis of self-observation, some evidence has been obtained that hunger consists of a mass of sensations, seeming to come from the stomach. As we shall see, definite changes in the condition of the stomach occur as time passes, and certain of these act as stimuli to produce the sensation of hunger which we feel and report.

Our understanding of the mechanism of hunger has reached a high degree of completeness through the combined efforts of psychologists and physiologists, who have performed various types of observations on the behavior of the empty stomach. The physiologists Cannon and Carlson and their many students employ a very interesting device to study stomach behavior.<sup>2, 3</sup> A sack of thin rubber with which a rubber tube is connected in such a way as to form an air-tight system is swallowed by the human or animal subject. The experimenter then adjusts the position of the sack by manipulating the rubber tube until the sack comes to a position at the upper end of the stomach. The sack is then inflated until it comes in contact with the walls of the stomach. The free end of the tube is connected with a recording device which makes a graphic record of any change of pressure in the stomach balloon. Dr. Carlson and his apparatus are shown in Figure 13.



Subjects are trained to swallow the balloon and sit comfortably for hours while continuous records of their stomach behavior are taken. Two types of stomach behavior are distinguishable from the records: (1) that which has to do with digestion; (2) that which occurs at the moment hunger is introspectively reported. These latter movements, the *hunger contractions*, are the ones which are of interest to us in our study of the hunger drive.

Hunger contractions are responses, having as their immediate stimulus the lack of material in the stomach. Eating inert and insoluble substances like moss, cotton, or wool will stop the hunger contractions but will not supply nourishment, indicating that the stimulus to the hunger contraction is mechanical rather than chemical. These contractions move the walls of the stomach and stimulate nerve endings embedded there, giving rise to the sensation of hunger and to the hunger drive.

If we put the stomach balloon in babies of a few days of age, we find even there a fair degree of correlation between the generalized activity and the contraction of the stomach.<sup>4</sup>

Carlson and his students gave particular attention to the genesis and strength of stomach contraction in relation to period of time elapsed since last eating. They found that the contractions do not occur immediately after eating. Only the regular churning movements of digestion are observed then. As the stomach empties, however, the hunger contractions set in. They appear about every hour and a half at first but come more frequently as time without food progresses. At first they are faint and may never lead to conscious sensations but become stronger and stronger with the passing of time.

*The rôle of the hunger drive.* In our discussion of the hunger drive we have brought food to the individual. But suppose there is no food in sight. In this situation the individual will explore his environment as actively as he can in search of food. This exploratory phase will last until food is found. If the hungry individual is repeatedly in a situation in which the same definite series of acts leads to food, the exploratory behavior becomes condensed to a direct path to the food. This process of eliminating useless movements is part of learning. Motivation is essential to learning, as we shall see in Chapter 9.

*Hunger contractions and other types of behavior.* Wada used the methods of Cannon and Carlson to study the direct relationship between hunger contractions and other types of behavior and experience in human subjects.<sup>5</sup> The stomach apparatus was kept in place for long periods with continuous recording. Subjects were asked to squeeze the hand dynamometer, which measures the strength of grip, at the moment when they were having contractions and also at other times. They were given intelligence tests during periods of activity and quiescence; their gross bodily movements were measured under both conditions. The results showed quite clearly that the human being can squeeze harder, gets a better score on a mental test, and is more active during periods of stomach contractions than during periods of quiescence.

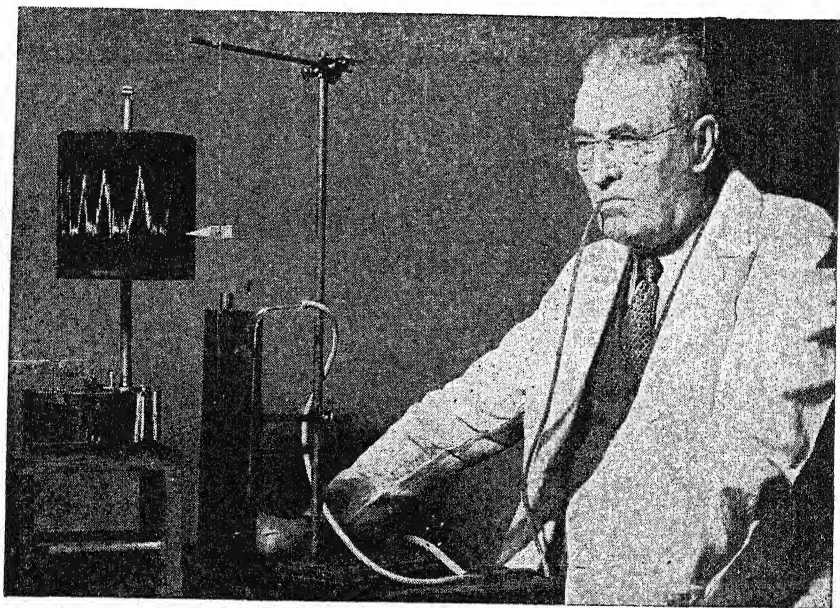


FIGURE 13. *Dr. Anton J. Carlson, professor emeritus of physiology at the University of Chicago, performing his experiment in which the periodic contractions of the stomach during hunger are recorded.*

Wada also had her subjects go to sleep with the apparatus in place. She watched the record and awakened them, sometimes during the contractions, sometimes between, asking them if they

had been dreaming. In general the evidence indicated that more dreaming occurred during periods of contraction than during quiescence. This finding explains the efficacy of drinking warm milk or taking some food just before going to bed to prevent dreaming and disturbed sleep.

A somewhat similar series of experiments, with white rats as subjects, was conducted by Elliott and Treat, who studied the effect of stomach contractions on the rate of learning to avoid an electric shock by jumping when a signal was given.<sup>6</sup> Food was not given as a reward for jumping, but the rats were given an electric shock whenever they failed to jump. White rats were selected for this study because it is possible by means of a surgical operation to bring the rat's stomach outside the body wall, where its contractions can be readily observed by the experimenter. Table 2 shows the comparative results of a group of white rats learning during hunger contractions as compared with a group learning at times when no contractions were taking place.

TABLE 2: *Learning in White Rats with and without Concomitant Hunger Contractions*

| RATS WITHOUT<br>CONTRACTIONS | NO. OF TRIALS<br>TO CONDITION | RATS WITH<br>CONTRACTIONS | NO. OF TRIALS<br>TO CONDITION |
|------------------------------|-------------------------------|---------------------------|-------------------------------|
| No. 13                       | 30                            | No. 18                    | 18                            |
| No. 5                        | 50*                           | No. 41                    | 18                            |
| No. 2                        | 51                            | No. 9                     | 21                            |
| No. 3                        | 53                            | No. 10                    | 24                            |
| No. 6                        | 56                            | No. 11                    | 25                            |
| No. 12                       | 57                            | No. 53                    | 30                            |
| No. 14                       | 71                            | No. 7                     | 34                            |
| No. 4                        | 75                            |                           |                               |

\*Since no evidence of conditioning was obtained by the fiftieth trial, efforts to train this rat were discontinued.

Notice that 34 trials were required in the case of the poorest rat in the "with contraction" group, while 30 was the best score in the "without contraction" group. In rats, at least, the presence of hunger contractions facilitates learning even when the reward is something other than food.

*Summary of the hunger-drive mechanism.* Let us start with the stomach full of food and review the mechanism of the hunger drive. The individual is inactive in general and particularly so

with regard to food-taking situations. As the food in the stomach is gradually used up, faint contractions, themselves responses to the emptiness of the stomach, are set up. These recur rhythmically as time passes, becoming more frequent, of greater duration, and of greater strength. The individual becomes keyed up and restless and more and more disposed to react to food. If none is in sight, he will set out in search of it. Activity in general is also increased. Eventually food is ingested, and the hunger mechanism becomes inactive again. The cycle is complete.

*Appetites as drives to action.* Why do we reach for the candy at the end of a heavy meal? We certainly are not hungry. Why do we like salt and other seasoning in our food? Soldiers who have been temporarily deprived of salt report that at its maximum intensity the craving for salt is more insistent than the desire for solid food itself. Cows and other stock which are not receiving enough lime eat the bones of other animals to relieve the craving. These conditions are not thoroughly understood at the present time, but it seems certain that somewhere in the body there are receptors which respond to the chemical conditions in the blood brought about by absence of certain substances necessary to the body. When these receptors are so stimulated, we have an "appetite" for the particular needed substance. Closely related physiologically to appetites, perhaps, are the aversions to particular foods. Appetites and aversions for different foods may vary from time to time. For example, think of the smell and taste of nicely crisped bacon upon waking up on a cold winter morning. Is this food as appealing to the appetite at the middle of a hot, humid, summer day? Some day careful research may reveal the essential sensory receptors involved in our appetites for and aversions to different foods.

Not all aversions are based on the physiology and chemistry of the body. Many aversions to particular types of foods are learned. Children will frequently reject a particular kind of food as a device for gaining the attention of the parent. This may lead to attempts on the part of the parent to force the child to eat. Such forcing often arouses unpleasant emotional reactions which become attached to the food itself.

From a practical point of view the appetites have exactly the

same rôle in behavior as does the more obvious hunger. When a strong appetite exists, even though the stomach be full, the organism is active until the stimulating conditions underlying the appetite, whatever it may be and wherever its receptors are located, are removed by the consuming of the desired substance. Hunger and appetites differ in that hunger is a generalized craving for food of any kind, while an appetite is a craving for a particular substance. As such, the term "appetite" may be employed in referring to objects of drives other than the hunger drive.

*Can we trust our appetites and hungers?* Davis attempted to answer the question whether we can trust our appetites and hungers by performing the following experiment on three newly weaned babies eight to ten months of age.<sup>7</sup> Two of the infants were allowed to select their foods for a period of six months; the third for a full year's time. An assortment of raw and plainly cooked foods was placed before the infants in dishes and glasses of standard sizes. The pattern of arrangement of the solid and liquid foods was haphazard and was changed from meal to meal. Each infant was permitted to eat with his fingers, and no attempt was made to teach manners during the course of the observations. Everything was left to the child to decide. The results show that the subjects made wise choices of food. They gained normally and showed no signs of nutritional disorders. There would seem to be an inherent "wisdom of the body" which causes even young children to prefer those foods which are best for them.<sup>8</sup>

The adequacy of this wisdom is revealed particularly by the behavior of one child who had rickets at the beginning of the experiment. Rickets is a defective bone development which can be cured by a vitamin in cod-liver oil. This child showed a marked liking for cod-liver oil at the beginning of the experiment but gave up this article of food when the rickets disappeared.

The babies' preferences for foods seemed to follow waves. A certain food would be taken in great quantities, while the others would be taken in correspondingly less amounts. After a period of days the preference would decline, to be supplanted by some other article of diet. The staff of the hospital diet kitchen described these waves of food preference as "egg jags," "meat jags," "cereal jags," etc.

In Davis's experiment the available foods, quite naturally, were all harmless. How well can the human individual select foods which are edible from a collection in which harmful or poisonous ones are represented? This is a question which cannot at the present be answered. Only further experimentation will supply us with the missing details. The fact that animals survive in regions where poisonous weeds grow proves that there is at least some of this form of bodily wisdom. At times, however, animals eat injurious substances or even poisonous materials. Evidently the wisdom of the body is not complete.

Occasionally some person eats substances not usually regarded as food, but this does not discredit the notion that the body has a tendency to select accurately the foods it needs. Many bizarre appetites have been recorded. In a certain type of anemia people are impelled by a craving to eat dirt and chalk. The writer once saw a young girl who drank great quantities of ink. She also ate dirt and paper. Her parents sent her to a mental clinic, because she was behaving in such a "crazy" fashion. Careful examination brought forth no signs of mental abnormality. She merely stated that she had a craving which seemed to be partially satisfied by eating these substances. She was referred to the medical service, where it was found that she was suffering from mineral deficiency. Her abnormal appetite was in reality a perfectly sane seeking for a substance which her system lacked in sufficient quantities. The physicians prescribed suitable medicine and diet, and her queer eating behavior disappeared.

Numerous experiments with animals have shown a similar ability to select the needed foods in about the right proportions to maintain health and to promote growth.

*How to enjoy your meals.* No discussion of appetite and hunger is complete without some suggestions for eating. We all eat, but many of us do not eat well. Take for example the matter of smoking at meals. Cigarette smoke contains a chemical substance called pyridine and also some nicotine. These two substances are narcotics which dull the sense of taste and destroy appetite. In many European countries people never smoke cigarettes during a meal. For them, the cigarette comes only with the after-dinner coffee. Gourmets of the truest dye may even refuse to eat in a room

where smoking is permitted. Likewise, they have been known to refuse to have sweet-scented flowers on the table because sweets, also, even when taken in by way of the breath, destroy appetite and reduce the joys of the table. The generally accepted practice of serving sweet dishes at the end of a meal is an application of a real fact of appetite.

The practice of many college students of drinking various sweet drinks before meals reduces appetite and should be abandoned by those who have trouble eating. On the other hand, the person given to overeating will find that a little candy before meals will help to keep his appetite within bounds.

Coffee tends to destroy appetite and is accordingly not taken until the end of the meal by many people, including the food-loving French. If, however, it is not convenient to eat, you can allay your appetite for food by taking a cup of coffee.

### *Thirst*

Thirst and hunger are closely associated in the life of the individual. From childhood on, satisfaction of one goes with satisfaction of the other. The source of thirst stimulation, however, is located at another part of the body from that of hunger. Self-observations by thirsty persons show that this sensation appears to originate in the throat and the back of the mouth. Many carefully controlled experiments with animals have borne out these observations. The normal course of events in the building up of a thirst drive is as follows.

*The mechanism of the thirst drive.* When the supply of water in the body becomes low, the fact is reflected in the degree of dryness of the mucous linings of the throat. The condition of the lining of the throat serves to indicate the amount of water supply in the body as a whole just as the water-level indicator on a boiler shows how nearly full the boiler itself is at a given moment. As the tissues of the throat become drier and drier, tiny nerve endings embedded in them are stimulated, producing the consciousness of thirst. The individual is thus motivated to set forth in search of water. That is, he becomes active and maintains his heightened level of activity until water is encountered and drunk, removing the source of the drive stimulation. If the organism is in a familiar



situation, it goes at once to the known source of drinking water—the familiar trough in the case of the farm animal, the cooler in the office or the tap in the kitchen in the case of man.

Pack, a physiologist, performed an interesting experiment to see whether the essential condition giving rise to the thirst drive is the condition of the throat tissues or derives from the condition of the body in general.<sup>9</sup> Eighteen rabbits were deprived of water for seven days. At the end of this period twelve of these rabbits were injected with pilocarpine, a drug which increases the flow of saliva thus moistening the mouth and throat. Notice that the amount of water in the bodies of the experimental animals was not increased. It is as if we forced water into the indicator of a boiler by some trick without changing the water level of the boiler itself. Only two of the twelve injected animals drank water when given an opportunity, whereas the six control animals drank copious amounts. These results are typical of those of other workers and leave no doubt as to the nature of the stimulation in thirst.

*The comparative strengths of the hunger and thirst drives.* The thirst drive at its maximum is far more insistent than that of hunger. Men who have been without food or water for long periods of time report that the sensations of thirst following deprivation soon become maddening, while those of hunger actually tend to disappear after a few days. Man can survive only a few days without water, but he can live for more than a month without food. Nature has graded the intensity of the drive to the seriousness of the physiological need for these two substances.

*Alcohol and thirst.* In everyday life we refer to a liking for alcoholic drinks as thirst. Appetite would be a better term since it is a desire for a specific substance. But the desire for alcohol is much more than a physiological appetite. The drinking of alcohol gives certain persons a release from worries, annoyances, and boredom and is indulged in by many seeking temporary escape. Thus the desire for it is apt to be made up of a combination of several drives. This point will be taken up in more detail in Chapter 6.

### *The sexual drive*

The sexual urge is second only to hunger in its implications for social living although, unlike the satisfaction of hunger, sexual ac-

tivity is not essential to life. Deprivation makes the sexual drive more *insistent* than hunger and our other drives which are not so apt to go unsatisfied. Our society does not place elaborate restrictions or taboos upon the food-taking behavior of its members. Sexual expression, however, is very closely governed by law and by firmly rooted conventions. Most of us seldom even experience real hunger.

We do not yet know just where the internal stimulus to the sex drive acts upon the nervous system to heighten responses to sexual objects. We do know that the intensity of the sexual drive is dependent upon the chemical conditions of the blood. Observations of both animals and human beings show that the sexual drive of the individual is profoundly influenced by the presence or absence of certain internal secretions which operate to render him more responsive to members of the opposite sex. The most important of these internal secretions is that produced by certain cells found in the reproductive organs—the ovaries of the female and the testes of the male. When these organs are removed by the operation known as castration, the individual loses much of his sexual drive. In later chapters we shall also see some effects of thwarting of the sexual drive and consider the implications for social living.

### *Skin conditions as drives*

Put a cat or a rat in water, and it will struggle about until it reaches dry land. Men wear hats or carry umbrellas to keep the rain from trickling down their necks. Most people do not like to sit for long in wet clothes. The hippopotamus, on the other hand, seeks water. According to the species of the animal, excessive dryness or excessive wetness of the skin will cause unpleasant stimulation of sensory receptors located in it. The desire to overcome the wetness or the dryness, as the case may be, becomes a drive to action.

### *Pain as a drive*

Pain, to serve best as a drive, must be prolonged and not too strong. Suppose that you touch a hot iron accidentally. You draw back your hand. This is a simple, specific, already organized re-

sponse—the withdrawal reflex. The localized pain of brief duration is not, properly speaking, a drive any more than all stimuli are drives. But suppose that even after you have withdrawn your hand the burn continues to smart and you go to the doctor to get it dressed. Here we are dealing with pain as a drive. The symbol standing for the doctor's office was stored somewhere in your memory but was not under ordinary circumstances reacted to, because the internal conditions were lacking to make it function. Given the drive of pain, the symbol dominates your behavior and leads to the trip to the doctor and consequent relief.

Pain has an important biological significance in that most harmful situations produce pain as well as injury. The desire to avoid pain and to protect others from pain has been one of the important motivating forces in the history of man. The search for better anesthetics which is going on right now is an excellent example. Pain touches the lives of all of us, and we pay homage to the medical men who discover and administer anesthetics which protect us from needless pain.

### *Air hunger as a drive*

One of the most basic needs of the human body is air. Yet the need for air is relatively unimportant as a motive. This is simply because under most conditions air is easy to get, and therefore air hunger is rarely experienced.

There are, however, situations in which partial air starvation does occur. Men trapped in submarines at the bottom of an ocean and pilots whose oxygen supply gives out at high altitudes sometimes suffer greatly.

When the supply of air (oxygen) from the outside is not sufficient for the needs of the body, carbon dioxide increases in the blood stream, stimulating receptors in certain blood vessels. It is thought also that air starvation becomes a drive to behavior through direct action of this carbon dioxide on a nerve center in the brain.

When oxygen lack occurs in an atmosphere free from carbon dioxide, as at mountain tops or in high altitude flying, a peculiar and often fatal sort of drunkenness or exhilaration comes on. The person loses control and may shout, fight, or burst into tears.

Memory is impaired, the senses function poorly, paralyses, especially of the legs, are common; yet throughout there is a feeling of confidence in one's abilities and a lack of realization of how serious one's condition is. There is some evidence that partial oxygen starvation brings out certain basic emotional reactions usually held under voluntary control.

### *Fatigue as a drive*

The physiology of fatigue is very complex. The chemistry of the blood is altered in several ways as the result of prolonged exercise: the concentration of lactic acid in the muscles and blood increases; the amount of carbon dioxide in the blood increases; the concentration of oxygen in the blood goes down. Presumably some or all of these conditions either stimulate the nervous system directly or activate some receptor of unknown location.

Tired people in their craving for rest go to great lengths to overcome obstacles in order to obtain it. Rest brings a readjustment of the body and a cessation of the persisting stimuli which cause consciousness of fatigue and efforts to rest.

### *Sleepiness as a drive*

Although sleep is an important need of the body, practically nothing is known of its chemistry. We do not know what receptors are active when we feel sleepy and search for a place to sleep. In all probability sleep is one of the most complex forms of human behavior. Probably, too, it involves a number of different receptors as well as possible direct stimulation of nerve and brain centers by chemical conditions within the body. One of the outstanding conditions bringing about sleep is a general relaxation of the muscles of the body. Certain drugs, such as chloroform and ether, produce a condition resembling sleep and suggest a chemical basis for sleep. On the other hand, it is well known that injuries to certain parts of the brain cause sleepiness. Finally, there is a theory which explains sleep as a conditioned (learned) response.

### *Visceral tensions as drives*

When the bladder and large intestine become distended, receptor cells in their walls are stimulated and produce drives. These

drives have little significance ordinarily as obstacles to their relief are seldom imposed. They have, however, all the essential characteristics of the other physiological drives.

### *Warmth and cold as drives*

The temperature of the human body is regulated by a complex mechanism of balancing heat loss against heat production. Thus the temperature of the surrounding environment as well as the heat produced by the body itself is involved. Our bodies, obviously, lose less heat to their surroundings on hot humid days than on cold days.

When the external temperature falls below 56 degrees, bodily metabolism is stimulated. Increased secretion of thyroxin and of epinephrin help bring about this increased metabolic activity. Blood is driven from the surface of the body to the deeper tissues. Increased muscular activity takes place. The blood pressure rises.

The reaction to heat is pretty much the opposite of the picture given above. When external temperature is raised, dilatation of the arteries at the surface of the body occurs. This exposes a greater

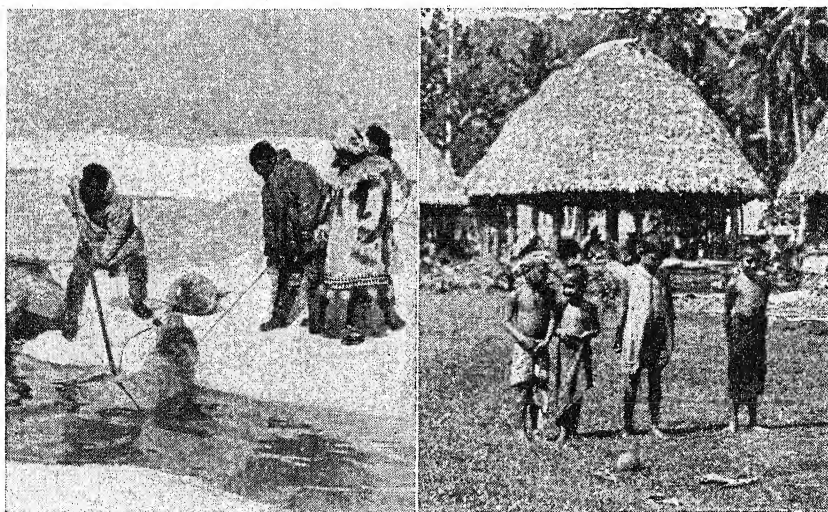


FIGURE 14. *With the living conditions and clothing of the people in the arctic and the tropics, contrast those of our own temperate zone. Clearly man's motivation, his way of life, is to a certain degree a measure of the temperature.*

volume of blood to the air and promotes cooling. The circulation rate is increased.

The barrage of stimulation which constitutes the temperature drive is of two sorts. There are receptors in the skin which are sensitive to heat and others which are sensitive to cold. In addition to this, one portion of the brain, the *hypothalamus*, responds directly to the temperature of the blood flowing through it. This center is vital to the temperature regulation of the body.

### *The exploratory drive*

The exploratory drive seems to be a fundamental one which has no definitely recognizable single physiological basis. When an animal is put into an unfamiliar situation, it moves restlessly about, examining each nook and cranny of the new surroundings. What is the physiological foundation of this "curiosity" drive? The present evidence indicates that the exploratory drive is simply an expression of all the drives that happen to be present at the moment the animal is put into the new situation. The hungrier a rat is, the more actively and thoroughly it will explore. Conversely, in a satiated animal, i.e., one in which no other drive is known to operate, there is little sign of exploratory activity—or any other.

Exploratory patterns are made up of simple habits which have worked in the past in time of need. When a need arises in an unfamiliar situation, they will be brought out. Why do rats explore only the unfamiliar situation? This fact has so impressed some writers that they have been led to postulate some mysterious "instinct" for which no physical basis has ever been found or seems likely to be. Apparently the rat merely explores a situation until it learns where the various rewards or reliefs are located. Stimuli which do not lead to relief of the drive tension are ignored after a time. Thus a hungry animal would not explore his familiar cage but might explore any new situation until he became negatively adapted to the new stimuli which led to nothing in the way of relief of physiological conditions. The exploratory drive in the lower animal seems, then, to be no more than an expression of all or any of his physiological tensions.

The phenomenon of curiosity in man must be to a great degree

like that of the exploratory drive in the lower animals. As soon as the baby is able to creep about, he discovers many interesting things. Perhaps his random wanderings take him to the easy chair which sits beside a reading table in the living-room. Once safely perched in the easy chair it is but one step further to seize a bit of candy from the box on the table. Exploration has been worth while and will be repeated. Perhaps the exploratory efforts bring no more reward than the welcome handling involved in the mother's rescuing her child from real or imagined danger. The results will be the same.

In man, curiosity is the subjective experience that goes with exploration, just as the sensation of hunger goes with searching for food. Curiosity and subjective hunger *go with* their appropriate activities of search; they *do not cause* those activities.

As the human individual develops, his curiosity in the world about him develops or fails to develop depending upon the type of culture which surrounds him. If the exploratory behavior of a child—whether direct or through question-asking—is frustrated and discouraged by the adults in his life, curiosity is to a large extent lost. If, on the other hand, curiosity and exploration are encouraged, they become highly developed in the individual. Social approval or disapproval of exploratory efforts determines their growth or stagnation. The scientist who spends years of patient research to discover the answer to some theoretical question does so because he has developed under a culture that rewards such behavior with social approval. The provincial individual, be he Manhattanite or hill-billy, whose curiosity about points outside his restricted radius is low is an individual whose culture did not encourage curiosity beyond certain limits.

Social approval is so important in motivating our behavior and, in fact, in motivating the development of our motives that we must consider it next.

### *How Drives Become Organized*

WHAT POSSIBLE BEARING does this business about stomach balloons have upon the deeds men do for "love of God and country"? Try to put these things side by side, and they seem



miles apart. How can we pass from the study of the sheer physiological needs of tissues and the resultant stimulation to an understanding of such attributes of man as his complex aspirations to know the world in which he lives, his vaulting ambitions, his capacity to pity and to aid, his patriotism and filial piety?

### *Symbolic rewards*

An important factor in the organization of drives is that symbols can take on reward value. Masters of dogs know how words can take the place of action in the life of the dog. This comes about as follows. On certain occasions the master whips the dog and at the same time scolds him for some wrong-doing. On other occasions the master pats the dog and rewards him with food, at the same time praising him affectionately. As a result of these conditioning processes harsh words from the master come to have the same effect on behavior as physical punishment; kind words and praise serve as rewards. Threats or words of criticism make the dog cringe and cower. Praise produces elation in the dog. Words have become symbolic.

If the dog shows this significant phenomenon of conditioned or symbolic reward, what could we not expect of the ape? Wolfe was able to train apes to work for a token which could later be exchanged for food.<sup>10</sup> Once the animals had been taught the symbolic reward value of the token, they would work as hard for it as for the food itself. Here we have a situation closely resembling the use of money as a medium of exchange in human society. Men work for money for what the money can buy, i.e., for its symbolic value.

Certainly if symbols can take on such reward value in the lower animals, the same process is to be expected in man. Let us take a typical day from the life of a human baby a few days old. Remember that babies can learn by conditioning. You will recall from the previous chapter that the Marquis experiment, in which nursing babies were conditioned to the sound of a buzzer, has shown that very clearly.

It is four o'clock in the morning. The whole house is quiet. The baby is sleeping peacefully in his cradle, warm and dry. As the six o'clock feeding hour approaches, the rhythm of his stomach

contractions speeds up. The contractions become bigger and last longer. Finally he wakes up, hungry and wet. His cries soon awaken the mother, and shortly thereafter he is changed and fed. During the process the infant is subjected to sources of gratification in addition to the food and relief from wetness. He is picked up and held. He is fondled and caressed by the mother. All this is accompanied by soft love talk. With the relief of hunger the talking stops, and the child is returned to his cradle until the next cycle of similar events. Suppose that the normal cycle should be interrupted by a pin's coming loose and pricking the baby's tender skin. Immediate howling is heard, and the mother rushes in to set things right. Again there is the association between the relief of a tension and the flood of tender phrases and loving caresses. As the child grows older, he starts to play with other children. It sometimes happens that he is hurt by some plaything or is bullied by an older child. Here again the mother sets things right and sympathizes with her child. Thus it goes throughout infancy and childhood—hunger, love, thirst, fear, pain are allayed in situations in which the omnipresent mother's voice plays a prominent rôle. Under these conditions the mother's voice symbolically takes on the reward value of purely physiological relief.

### *Why we work for social approval*

Looking back over the two preceding pages, then, we see that symbols can serve as substitute satisfactions. Dogs, apes, and human babies are alike in this fundamental respect. Words and objects which are in and of themselves incapable of satisfying drives and are not originally sought after in their own right can be associated with real rewards and will eventually acquire power of their own to satisfy human drives. Let us see how symbolic reward operates as the child grows slowly to maturity.

As the child grows older, his store of symbols increases. Mother is kind and gentle most of the times when she helps the child to find relief from his physiological drives. At other times she is less so. She may even say, "It's your own fault. I told you not to play with those older boys." Or again, "You *will* take off your shoes and stub your toe." From experiences of this sort the child learns that maternal approval goes with certain deeds and that disap-

proval goes with others. When the right thing is done, the satisfaction which is so closely correlated with maternal approval is had; when the wrong thing is done, disapproval is expressed, and the child may be punished. Thus his behavior changes to conform to the standards which will bring approval.

Here we have an explanation of the rise of the desire for social approval. At first, social approval is significant when coming from the mother, nurse, or close members of the family. Later the individual comes to feel a need for the approval of society as a whole. We have passed from the simple physiological drives shared by animals and men alike to the higher motive of desire for social approval, which is the biggest stick society has to control its individuals for the common good.

### *Man's many motives*

There are many of these higher motives built up on the physiological foundations we have already discussed. How many, nobody knows, because they merge into one another by imperceptible degrees. Any classification of human motives would be made merely for convenience in talking about them. Because of the great amount of overlapping, the motives are hard to list.

1. To make money.
2. To earn social approval.
3. To have friends.
4. To avoid scorn.
5. To dominate another person.
6. To submit to another person.
7. To relieve suffering in others.
8. To beget and care for children (as apart from organic sex).
9. To care for one's parents.
10. To maintain the *status quo* (conservatism) in business, religion, politics, morals, etc.
11. To depart from the *status quo* (radicalism).
12. To be with other people (as apart from sex).
13. To laugh when amused.
14. To imitate someone you respect.
15. To understand when mystified.
16. To gain one's own respect and approval.

Notice how the social approval motif runs through this list. We strive to make money because it brings us social approval and power over other persons. The man who is born a multi-millionaire cannot spend his fortune for necessities of life, yet he works hard to increase his earnings. Obviously, for such a man, wealth serves to gain prestige and respect and is sought for that reason. We respect the person who works for the respect of others, for in the desire for social approval we have the fundamental motivating force which directs society.

Self-respect is not very different from social approval. We work for both. The desire for self-respect and that for social approval can both be traced back to the conditioning afforded by early training. The average individual accepts the standards of the society in which he lives because they have been the basis for his parents' approval or disapproval. He judges himself by these same standards. When his conduct conforms to the standards, he approves it; when his conduct does not conform, he disapproves it.

Social approval will continue to have reward value at least as long as it remains associated with the relief of physiological needs. We will continue to love the country or parents that provide us with material comforts. Should it become apparent, however, that country or parents are failing to provide the things we want, the desire for their approval may eventually decline. A society which does not give us an opportunity to earn a living but forces us to undergo the humiliation of charity after having conditioned us to be independent and self-respecting soon loses the power to motivate through the giving or withholding of approval. Social approval is desired only when the approving society is itself approved of by its members. The honest man does not want the approval of thieves; the frank man does not want the approval of hypocrites; the radical does not want the approval of conservatives. The criminal works for social approval as much as does the honest man. The only difference is that the criminal is concerned not with the approval of society as a whole but with that of a small group whose codes of behavior run counter to those generally accepted by most members of the society. We want the approval of the persons to whom we were originally conditioned or of persons like them to whom our conditioning has spread.

The loss of the power of an inadequate society to motivate its members is just another instance of extinction of conditioned responses which are no longer rewarded by material benefits. The fact that some people break away from the need for approval by their society can be a force for good or for evil. If the shortcomings of a social order are reacted to by non-conforming behavior which is directed toward legitimate social reorganization, the end effect is good. Such dissenting behavior can produce needed social reform. When, however, the non-conforming behavior violates the accepted rules through resorting to violence and bloodshed, the outcome is usually bad. In a democracy, the right of a citizen to vote is basic. It is a rule of the game. A minority group which tries to get its will by intimidating voters is to be condemned. The ideal of peaceful change has been very firmly implanted in democratic people and is surrendered only in extreme emergencies.

### *Interests and values as motives*

An *interest* is a feeling which accompanies some activity in progress. The word "interest" is usually used by psychologists in a positive sense. That is, if the feeling which goes with the performance of some particular activity is pleasant, we say that the individual is interested in that activity. The origin of interest in the experience of the individual is probably very complex. Two important factors in the development of interest are recognized by psychologists. In the first place, those activities which are easy for the individual are likely to be the most interesting. For example, if you have a high native ability for music, you are more likely to find music interesting than is the individual who is born with poor musical aptitude. The factor of social approval is also very important in steering the development of our interest. For example, you might possess the complex of native abilities necessary to accurate marksmanship, but if you have been trained by your parents or at school that it is cruel to shoot animals, i.e., that the shooting of defenseless animals is not a way of gaining social approval, the chances are that you will not become interested in hunting as a sport. On the other hand, if you possess these abilities and associate with people who are interested in hunting in a culture in which hunting is socially recognized as a

principal way of getting food, then the chances are very strong indeed that you will develop a keen interest in hunting.

Interests, once they have been formed, may be expressed directly or indirectly. One of the most common means of indirect expression of interests is through reading about the activities pertinent to your interest. Other indirect expressions of interest are found in motion pictures and radio programs.

Human goals may be classified according to the importance that they have in our lives. If a goal seems well worth attaining, we say that it has a high degree of value. When a goal seems scarcely worth attaining, we say its value is small. If it is something to be avoided, we say it has a negative value.

Individuals show great differences in their systems of values. Each individual's system of values is largely determined by his early environment. For example, one child might grow up in a home in which money-making is valued and might accept the values of his parents, whose love and respect he desires. Another might grow up in a family which puts self-sacrifice and service ahead of other human values; such a child would probably accept the same values. Our values are developed by a process of learning from others with whom we associate.

The home together with the school is usually the great conditioner of human responses. There are, of course, cases in which the child becomes alienated from the parents and home for one reason or another. Such a child would seek the approval of persons outside the home and would accept their values. Psychologically this situation is no different. The fundamental thing is that we strive for the approval of certain persons whose relations with us please us, and their ways tend to become our ways.

### *The Comparative Strength of Different Drives and Motives*

**I**N MAN the simplest, but not necessarily the best, way to measure the relative strength of drives and motives is to have subjects look back over their behavior of the past month or so and indicate how strongly they have been influenced by each one.

Starch obtained ratings on the strength of various drives and motives from a group of 74 men and women who were given the following instructions: "Ask yourself in connection with each one [drive or motive] how important it is in determining your own actions from day to day. Write 10 after the very strongest and a number between 0 and 10 after the others, according to their relative strength or importance."<sup>11</sup>

The method employed by Starch is open to certain criticisms. The subjects have difficulty in interpreting the items of the list supplied them in terms of specific actions of everyday life. Also, the human being is given to the process of "rationalization," or the covering up of his real motives through the pretense that his actions were brought about by some higher ethical consideration. This process of rationalization is so interesting and so fundamental to the understanding of people that it will be discussed in detail in Chapter 6. Despite these limitations, Starch's figures have considerable interest to the student of psychology. Table 3 gives his pooled ratings of the strength of 44 biological drives and social motives.

The strength of drives as we know them in our daily life is not proportionate to their biological importance (as judged by the length of time the organism can go without the object which satisfies the drive or by the degree of injury to the organism brought on by a certain period of privation). As you have already seen, air, food, and water, though biologically important, do not for us seem to have the significance as drives that sex does, for example, since for most of us they are easily obtained.

### *Using Our Knowledge of Motivation*

THE APPLICATION of the facts of human motivation are as broad as life itself. The school-teacher applies a knowledge of motivation when she attempts to make school work interesting to the child. She knows that if a child is consistently held to work in which he has no interest he will gradually develop the habit of dividing his attention. He will neglect the work at hand. The aim of modern education, sometimes called "progressive education," is to arrange the work of the school in such a way that it has a very



TABLE 3: *Pooled Ratings of the Strength of 44 Biological and Social Drives and Motives*

| DRIVE OR<br>MOTIVE  | RATED<br>STRENGTH | DRIVE OR<br>MOTIVE   | RATED<br>STRENGTH |
|---------------------|-------------------|----------------------|-------------------|
| Appetite-hunger     | 9.2               | Respect for Deity    | 7.1               |
| Love of offspring   | 9.1               | Sympathy for others  | 7.0               |
| Health              | 9.0               | Protection of others | 7.0               |
| Sex attraction      | 8.9               | Domesticity          | 7.0               |
| Parental affection  | 8.9               | Social distinction   | 6.9               |
| Ambition            | 8.6               | Devotion to others   | 6.8               |
| Pleasure            | 8.6               | Hospitality          | 6.6               |
| Bodily comfort      | 8.4               | Warmth               | 6.5               |
| Possession          | 8.4               | Imitation            | 6.5               |
| Approval by others  | 8.0               | Courtesy             | 6.5               |
| Gregariousness      | 7.9               | Play or sport        | 6.5               |
| Taste               | 7.8               | Managing others      | 6.4               |
| Personal appearance | 7.8               | Coolness             | 6.2               |
| Safety              | 7.8               | Fear or caution      | 6.2               |
| Cleanliness         | 7.7               | Physical activity    | 6.0               |
| Rest or sleep       | 7.7               | Manipulation         | 6.0               |
| Home comfort        | 7.5               | Construction         | 6.0               |
| Economy             | 7.5               | Style                | 5.8               |
| Curiosity           | 7.5               | Humor                | 5.8               |
| Efficiency          | 7.3               | Amusement            | 5.8               |
| Competition         | 7.3               | Shyness              | 4.2               |
| Coöperation         | 7.1               | Teasing              | 2.6               |

real interest to the pupil. This is done by making the school work part of the interesting process of life itself. Arithmetic is not studied through drill and the solution of arbitrary problems but is put to use in some worth-while connection, for example, in such problems as "How much interest do you really pay when you borrow money from a finance company on a new automobile?" and "How much does it cost to operate an oil furnace as compared with a furnace burning hard coal?" Arithmetic, when viewed as a means of answering these important practical questions, is an interesting activity.

In the teaching of reading, even with very beginners, it is possible to dispense with the old-fashioned dull drill that was at one time thought to be essential. Nowadays a beginning class reads a story about fire engines and then goes to the fire-station to see

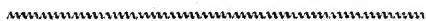
how the apparatus works. Next the class learns how to tell somebody in another town what they saw at the fire-house. Thus, reading and writing are capped together as tools of communication rather than as isolated disciplines. By motivating children in this way the teacher is able to raise their level of achievement.

The modern industrialist is called upon to make frequent application of his knowledge of human motives. Today efforts are made both to broaden the interests of the worker and to make his job more interesting. Just how this is done will be treated in considerable detail in Chapter 14.

The salesman must understand human motives if he is to sell effectively. The politician, also, must understand the mainsprings of human action if he is to build up and maintain a following.

The art and science of getting along with people is not limited in application to the practice of the professions or the successful transaction of business. Everyone has need for skill in human relations every single day of his life. This whole matter is so important that Chapter 15 is devoted to it.

This chapter has left many of these questions unanswered. Many of them, however, will be taken up and answered in later sections of the book. It is impossible to treat a problem as complex and far-reaching as that of human motivation within the short space of one chapter. Motivation is not an isolated, special problem; it is a central problem in relation to which all the facts of psychology must be viewed.



Man's behavior is directed by external and internal stimuli. The internal stimuli are called drives. These stimuli accompany certain physiological needs some of which are of life-and-death importance and cause the organism to remain active until satisfaction of the need is obtained. Without food, water, air, and protection from injury it would soon cease to exist. If the demands of sex did not operate strongly, there is a strong probability that the race would cease to reproduce itself and would vanish from the earth. The physiological drive is unlearned; it is a barrage of internal stimulation leading to general bodily activity. When the individual learns what to do about a drive, what and where the goal or object is, we say that the drive has become a motive. The conditions of our daily

living are such that the satisfaction of our fundamental physiological drives becomes associated with objects which, in the process, acquire a power to satisfy higher motives and come to be sought after as much as or even more than the immediate physiological satisfactions themselves. Of all the objects which acquire the power to serve as substitute satisfactions, the approving human being is the most important. Thus we develop the desire for social approval and self-respect—the greatest guiding forces in civilized living.

Knowledge of human motivation is essential to the control of human behavior. Some control of human behavior, both your own and that of others, is essential to success and happiness in life.

### *Recommended Readings*

BIRD, CHARLES. *Social Psychology*. D. Appleton-Century, 1940.  
Read Chapter 2.

CANNON, W. B. *The Wisdom of the Body* (revised edition). Norton, 1939.

How the body maintains constant conditions within itself when in a changing environment. This book contains a great deal of background information needed in the understanding of the physiological drives.

GOLDSTEIN, K. *Human Nature, in the Light of Psychopathology*. Harvard University Press, 1940.

Read Chapter 6.

KLEITMAN, N. *Sleep and Wakefulness*. University of Chicago Press, 1939.

The author brings up to date a summary of literature on sleep.

SHAFFER, L. F. *The Psychology of Adjustment*. Houghton Mifflin, 1936.

Read Chapter 4.

TROLAND, L. T. *The Fundamentals of Human Motivation*. Van Nostrand, 1928.

This book, first to have the term motivation in its title, uses the nervous system to explain motivation.

YOUNG, P. T. *Motivation of Behavior*. Wiley, 1936.

The most recent book devoted to motivation and the only comprehensive one.

*"Of all the tyrants the world affords, our own affections are the fiercest lords."* STERLING

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## CHAPTER 4

# EMOTIONS

*Emotions under control are helpful; out of control, they make life miserable and inefficient. Herein you will see what your emotions are to you . . . what they do to you.*

SUPPOSE you suddenly awake from a sound sleep to the roar of flames and the smell of burning wood. In the distance you hear the screech of the fire siren. You dash into the hall shouting to wake the family when suddenly you realize they are all away for the weekend and you are alone in the burning house. You try the front stairway but can get nowhere near it because of the intense heat. You run to the rear stairway and discover that the heavy door has been bolted from the other side. What's to be done? The wild idea of seizing the fire extinguisher and putting out the blaze occurs to you. No sooner does this thought come than you dismiss it as ridiculous. The fire has progressed far beyond hope of extinguishing it so simply. The roar of the flames becomes louder, and the heat by now is terrific in intensity. Despite the heat, your forehead is wet with a cold sweat. Your in-

sides feel as though you had been riding on "the whip" at the carnival show for hours. You run to the bedroom window again and look down at the hard frozen ground. "Dare I jump?" you ask yourself. "If I do, I'll certainly break a leg. Will those firemen ever get here?" By now the roaring flames can scarcely be heard over the noise of your wildly beating heart. One more desperate look around the room, and you decide to jump. You seize a chair and break the glass out of the window. Just as you do so, the first fire engine rounds the corner. You balance on the sill while the firemen prepare the net below. After another eternity they give the signal and you jump, not a moment too soon.

### *What Our Emotions Are and Do*

THE EMOTION in the situation just described is easily recognized as fear. Fear is one of our fundamental emotions. How does behavior in extreme fear differ from less spectacular and more routine everyday behavior? How does it differ, for example, from such a common everyday act as stoking a furnace? The most obvious difference is that stoking a furnace allows behavior which is smooth and specific. Once you have learned how a furnace is stoked, you make very few false movements. You waste very little time trying first this method, then that. You go about the whole business in a leisurely fashion without, indeed, paying very much attention to what you are doing. Contrast your routine execution of this simple task with the violent, energetic, and disorganized way in which the normal human being acts when confronted by some emergency such as the fire just described.

In everyday life there is no sharp line of demarcation between non-emotional and emotional behavior. Many activities are begun in a calm, unemotional way and continue thus until some obstacle or emergency is encountered. Your behavior might then become emotional.

Let us take an example. Suppose you are engaged in a friendly political discussion with your roommate. He presents arguments which you try to answer, and you bring up points which he attempts to refute. This pleasant give-and-take proceeds smoothly for a time. Eventually, however, it becomes apparent that he is losing

the argument. Time after time you are able to show that his arguments are not well thought out, that they are mutually inconsistent, or that they are based not on facts but on obvious misinformation. The more clear it becomes to you that you are winning the argument, the more pleasure you get from the discussion. Your friend, however, is not enjoying the situation nearly so much as you are. At first the evidences of this are rather subtle. He becomes a little tense; he breaks in before you have finished explaining a point. A little later he introduces material which is not relevant to the discussion in any way but is of such a nature that it reflects upon you as a person. Eventually you become aware that he has become angry and humiliated at his inability to hold up his end of the discussion. Noticing this, and fortified by the feeling that you have really won the argument, you decide to let up a bit. This gesture on your part serves to infuriate him even more, symbolizing as it does that you are the victor and he is the vanquished. By this time the rules of logic have been forgotten completely. Your friend loses his head and starts calling you names. It is only by pretending that you have a term-paper to write that you are able to get out of an unpleasant situation without an actual exchange of blows. Here, obviously, we have another of the fundamental emotions—anger.

Man has many emotions. Some of them are good for us most of the time. Some of them are bad for us most of the time. Others are good or bad for us depending upon circumstances. The following material should help you understand your own emotional life as well as the emotional life of others with whom you work and play.

### *What Our Inborn Emotional Patterns Are\**

POETS have, until recent years anyway, written about the soul of man pouring itself out in emotion. Man has had a long time to accumulate misconceptions and downright false beliefs

\*You must not lose sight of the fact that learning and maturation are interdependent and quite incapable of separate existence. You must remember that when we write of an emotion as learned or native we are speaking practically and to save time. When the writer says "learned emotions," he means emotions in which the learned elaborations are great in proportion to the natively given foundation. There is, of course, always an underlying basis in the form of a neural pattern laid down by heredity.

concerning his emotional life. Many strange superstitions have developed as to what emotions are inborn. Only within the last half century have men attempted to arrive at a naturalistic understanding of emotional life.

Watson and his students undertook to separate the true from the false in our beliefs about our emotional life.<sup>1</sup> Their method was simple, direct, and effective. Children whose complete histories since birth were known were subjected to such situations as sight of fire, snakes, rats, dogs, cats, and frogs, and to assorted sounds. The experimenter would drop the tiny babies only to catch them safely and without injury after a free fall through space. Their body movements were restrained. Stimuli were presented unexpectedly and suddenly. An effort was made to present all imaginable stimulus situations which might be expected to arouse emotion.

The responses of the infants to each of these stimulating situations were carefully recorded by trained observers. The records were later analyzed to see if definite patterns of response stood out. As a result of this type of work initiated by Watson and carried on by his students and others, we now know far more than we formerly did about the inborn versus the learned nature of emotional patterns of response. Let us examine the evidence.

### *What fears do children have?*

Until Watson made his studies on emotion, infants and children were generally thought to have inborn fears of many things.

*Reactions to animals in the laboratory.* For example, popular belief holds that babies and young children instinctively fear furry objects. Through the centuries this belief has persisted because nobody had been sufficiently interested or sufficiently trained to put the notion to a rigid test. Watson was the first to perform such a test. His methods here are typical of his general approach to the problem of determining the elements in our emotional repertoire.

The subjects were hospital-reared babies four to five months of age whose complete histories were known. Nothing had happened to these children in the way of injury or other unusual experience which was not carefully recorded by the specially trained and instructed nurses and experimenters. Under these circumstances



the criterion of appearance-in-the-absence-of-opportunity-to-learn could be applied in a way that would never be possible with children reared in the more or less hit-or-miss atmosphere of the average home. These babies had been reared in virtual isolation from the numerous emotional stimuli normally encountered. These stimuli were thus experienced by them for the first time under laboratory conditions, with trained observers standing by to record the full story of the child's responses.

In the first test of this series a lively black cat was shown to the infant. "Reaching out to touch the cat's fur, eyes, and nose was the invariable response."<sup>2</sup> Tests of this sort given to many infants with the same results lay low the old notion about the black cat as a naturally fearsome thing.

A rabbit was presented in similar fashion. The responses were essentially the same. The only difference was that the child often grasped the ears in one hand and thrust them into his mouth. No evidence of fear of the furry rabbit was obtained in any of the trials with any of the subjects. When friendly Airedale dogs both large and small were presented, the results were similar, except that with the large animals little manipulatory behavior was observed.

Since children with no previous opportunity to learn showed no fear of any of the animals used, Watson concluded that the prevalent beliefs that children instinctively fear furry objects were "just old wives' tales."<sup>3</sup>

Feathery objects, usually pigeons, were presented in paper bags. The bird would struggle and move the bag about on the couch. Often the pigeon would coo. The child rarely would touch it while it was rustling the paper bag. When the pigeon was held in the experimenter's hand, the child would manipulate it in his customary fashion. When the pigeon, its wings flapping violently enough to make an adult flinch, was held near the baby's face, the manipulatory responses did not occur, but no evidence of active fear was observed. Watson's essential conclusion was that feathery objects have no more native potency to elicit fear than do furry objects.

*Reactions to animals in the zoo.* In the summer of 1924 Watson took his own two children to the Bronx Zoölogical Park. The

older child was a boy of two and a half years; the younger, a boy seven months old. The older boy had been conditioned, but in a known way. He had seen many animals but had shown no fear of any except the dog. This fear followed being attacked by a dog. At the zoo he was shown various animals, including brightly colored tropical birds and elephants. He showed no fear. The behavior of the baby was that of complete boredom, although now and then the birds would bring out a fairly sustained fixation of the eyes. The writer has been able to corroborate most of these observations with his own daughter.

*Only the burned child fears the flame.* This caption is a necessary revision of the old saying—"The burned child fears the flame." Numerous experiments performed on young babies whose previous emotional life is known show that no fear of the fire is present until the child has been burned or otherwise taught to avoid the flame. The first response of the baby to a flame is to reach for it.



FIGURE 15. *Only the burned child fears the flame.*

*Do babies fear the dark?* Reasoning before the fact has convinced many unscientific thinkers that there is a hereditary fear of the dark, dating from that age of man when darkness gave the advantage to his prowling enemies of the jungle. "It seems logical

that we fear the dark, for such a fear would keep us in at night and safe from our enemies," reason these arm-chair philosophers. "Therefore, we are afraid of the dark." Controlled observations show this notion to be groundless and the logic to be hollow. When a child cries as the light is turned out at night, it is either because his nurse or parents have not been sufficiently careful in protecting him against acquired fears or because he is angry at being taken away from the family group.

*The loathsome, fearsome snake.* In the symbolism and mythology of many peoples the snake is an object of fear and loathing. In the Old Testament it is the symbol of the downfall of man. No doubt our tradition would suggest to an uncritical mind that our fear of the snake is inherited. What are the facts? Watson and others whose results we shall discuss presently have shown that the fear of the snake does not manifest itself in babies less than a year old or in children two or three years old who have been carefully reared in isolation from contact with snakes and snake lore.

### *Watson's categories*

What, then, did Watson and his students discover to be the inborn emotional patterns? Their research revealed three types of emotional response in the naïve human baby—*fear* (of two kinds), *rage*, and *lust*. Very few stimuli will bring out these responses. These, said Watson, are the basic materials from which the complex adult emotional structure emerges by the combined action of maturation and learning. Watson prefers not to call these emotions fear, rage, and lust, but *x*, *y*, and *z*, since such a nomenclature helps to prevent distortion of the truth through the action of old preconceptions.

*The emotion of fear.* Watson found two stimuli which always caused fear—loud sounds and loss of bodily support. The experimenter produces the loud sound stimulus by striking a gong or an iron bar; the loss of bodily support, by allowing the child to fall freely through space to the hands of an assistant.

Later writers have reported other situations and conditions inducing fear without previous conditioning.<sup>4</sup> It now appears that almost any unexpected, strong stimulus, such as a sudden flash

of light, will produce some fear in the infant. The important factor here seems to be the suddenness and will be discussed in the next chapter.

The response in fear, Watson says, is definitely recognizable and is not easily confused with those in other emotions. This response is described by him as follows: "Checking of breathing, 'jump' or start of whole body, crying, often defecation and urination. . . ." <sup>5</sup> The response to the loud sound is quickly "fatigued." That is, repeated presentation of the sound leads to less and less violent response.

*The emotion of rage.* Watson found the essential stimulus for the response of rage in an infant to be restraint of bodily movement or whatever activity the child is engaged in. The arms, legs, head, or all three, or any two, were held motionless by the experimenter, lightly enough not to cause painful pressure. The restraint of movement did not need to be complete. Any noticeable hampering of physical freedom led to the rage response. With older children it is no uncommon thing to see a fit of temper in the child whose dress does not come off easily or in one who cannot get his shoes untied.

The responses in rage are described by Watson in these words:

Stiffening of whole body, screaming, temporary cessation of breathing, reddening of face changing to blueness of face, etc. It is obvious that while there are general overt responses, the greatest concentration of movement is in the visceral field. Blood tests of infants so manhandled show that there is an increase in blood sugar. This means probably an increase in the secretion of the adrenal glands—release of increased output of adrenalin. <sup>6</sup>

*The emotion of lust.* The observations on the behavior in the so-called emotion of lust were mainly incidental rather than experimental. Social convention has set aside the sexual behavior of the individual as something quite different from fear or anger. To the psychologist this distinction does not exist. Fear is no more worthy of investigation than is sexual emotion. Although social conventions cannot be ignored, especially when working with other people's children, enough incidental observations in connection with dressing and bathing tiny infants have been made to permit the description of this fundamental pattern of behavior.

The adequate stimuli to the emotion of lust in an infant are

stroking of the skin and sex organs, rocking, riding the baby on the foot, and the like. Some stimulation of this sort cannot be avoided in the routine caring for the baby and is certainly not harmful. Here is Watson's description of the behavior:

Cessation of crying, gurgling, cooing, and many others not determined. That visceral factors predominate is shown by changes in circulation and respiration, erection of the penis, etc.<sup>7</sup>

*Emotions considered by other writers to be inborn*

As we have seen, Watson held that only three emotional patterns could be discerned in the behavior of the naïve human infant. Other writers have found evidence for the inclusion of two or three others.

*Gloom as an emotion.* Hollingworth is convinced that there is

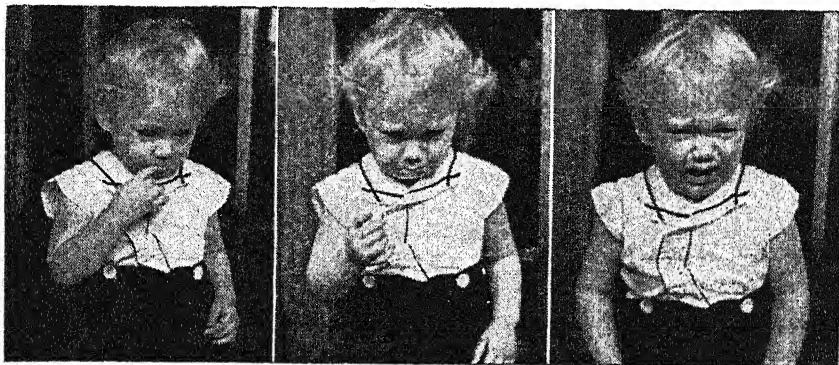


FIGURE 16. *Gloom is obvious in this two-year-old.*

a fourth emotion of gloom or dejection.<sup>8</sup> This reaction is not obvious until the child grows and matures beyond the ages studied by Watson and his followers. Gloom, or dejection, involves a vague, depressive reaction aroused by frustration long continued. The author's own observations convince him that dejection is a real pattern in children, occurring when any fundamental behavior pattern is repressed or otherwise interfered with over a long period of time. The first stages of the onset of hunger give rise to discontented crying which lacks the vigor and quality of the shrieks of anger, fear, pain, or even of extreme hunger. In the older child the violent outburst of emotion which follows some punish-

ment often merges into a period of dejected sobbing as a terminal phase. Gloom is a formless state characterized more by the lack of vigorous action than by any particular type of behavior. The body sags. The face droops, expressionless. The dejected child sits idle and motionless, refuses requests to come and play, shrinks from any challenge. In the adult the postural- and facial-expression patterns in dejection are as familiar as the haven't-got-a-friend-in-the-world feeling that goes with it.

*Elation as an emotion.* Whereas gloom is an amorphous emotion characterized by lack of any response in particular, elation is a condition in which all responses are intensified. In the baby, contentment is probably mild elation. With no obstacles, and everything to his liking, the baby is contented. The elated adult walks briskly and moves with enthusiasm and certainty as though



FIGURE 17. *Our hero, on the other hand, can show all the adult signs of elation.*

success were a foregone conclusion. He talks more rapidly than usual, thinks faster, smiles more broadly, and is pleasantly "keyed up." The elated person welcomes tests of strength and power. The stimulus condition to elation is the successful achievement of the goal of any motivated behavior. Elation follows the hard-won victory and is greatest when the victory has been least expected.

*General excitement as an emotion.* Stratton feels that there may be an emotion of excitement.<sup>9</sup> He says: "It (excitement) is easily distinguished . . . from the elation of the victor and from the depression of the vanquished. In either of these two emotions, pleasure or unpleasantness comes to a high pitch and occupies a



prominent place in the total complication. Excitement, on the other hand, while it may be pleasant or unpleasant, is mildly so, and it may be mixed or perhaps neutral . . . what is more prominent in excitement is the tension, the expectation, the readiness for instant adaptation to novel openings in the situation; there is a distinct looking for something to come."

Thus we see that people are born with certain emotional responses ready to function in the absence of opportunity to learn. How many there really are is difficult to say, for the border-lines between them are not very distinct. The present classification of five or six must be regarded mainly as one of convenience.

### *Emotions Function in Many Ways*

SOME OF our emotions are very intense, as in the case described at the beginning of this chapter; others are so weak that they provide no more than coloring for our experience. Some merely add to the joy or displeasure of our everyday living; others are capable of having a tremendous effect on the efficiency of our activities.

#### *Strong emotion*

Emotions when very intense can either help or hinder us in a very real way.

*Emotions can prepare for action in an emergency.* Recall the illustration given at the beginning of this chapter concerning the fire and the strong fear aroused by it.

The function of such emotion is to prepare the body for sustained action in an emergency. Under the impetus of fear, for example, men and animals are able to perform feats that would be impossible for them under normal conditions. In three ways emotion helps the individual cope with an emergency situation.

(1) In strong emotion a person is able to exert himself over a longer period of time than would be possible if he were entirely calm. One successful track coach never allows his milers to run more than three laps in practice. He paces them to a winner time first on one lap, then on two, and finally on three laps. He depends upon the emotion of the actual track meet to carry the runner



through the last lap and, in fact, to supply the burst of energy needed for the final sprint which may determine who wins the event. (2) A second effect of strong emotion is the capacity for a momentary exertion of enormous strength. A frightened man once carried a small safe across a room in a burning building and threw it out the window. Later, after his fear had subsided, he found himself barely able to budge the safe. (3) The third effect of strong emotion is that of rendering the individual insensitive to what would normally be excruciating pain. A college football player went into three successive plays with a dislocated knee-joint which made his right leg completely useless and which under less excitement would have caused him unbearable pain when moved or touched. Shortly after the player was taken out of the game, he fainted from agony and exhaustion.

*Emotion can upset our patterns of response.* Although emotions are of adaptive value in such emergency situations as these, upon other occasions they can be distinctly disadvantageous. Our finer performances are impaired by very strong emotion. The tennis player or baseball pitcher who "loses his head" in a game is lost. The effect of strong emotion on ability to execute well-learned verbal responses is illustrated by "stage fright." Emotion is even more destructive to original thought. The person who can "think on his feet" is fortunate, though his gift may be emotional control rather than unusual intelligence.

### *Some everyday emotions*

Most of our everyday emotions are fairly insignificant as judged by the standards of the emergency-facing cave-man. The results of several studies on the so-called "everyday emotions" afford us considerable concrete information as to their nature and function.

A group of fifty-one college men were asked by the writer to report the emotions of fear, anger, worry, annoyance, jealousy, shame, elation, and dejection experienced during the preceding typical week. All of these play a part in our lives. Worry is essentially a fear reaction attached to some future event which may or may not take place. Jealousy is a combination of anger and dejection. Annoyance is a mild form of anger. Worry was the most frequently reported emotion and was listed by 46 of the students

in the group. The other emotions and their frequencies follow: annoyance, 43; elation, 35; anger, 34; fear, 31; dejection, 29; shame, 22; and jealousy, 15. Obviously the strong emotions of anger and fear are less important in daily living than the nagging worries and petty annoyances which beset us.

*Worry and fear.* Worry and fear, taken together, are more frequently reported than anger and annoyance combined. Worry usually comes in the evening during the study period. The same is true of fear. Worry usually lasts two or three hours, according to students' reports, and is more often experienced during the middle of the week than on week-ends. Fear is of shorter duration, but it also tends to occur more frequently during the week. The most common cause of fear and worry reported was that of failure in courses. Only two students reported fear due to other causes.

*Annoyance and anger.* Annoyance also is likely to occur in the evening and is usually directed against some other person. It is typically of short duration, lasting on the average about twenty seconds. When it passes, it leaves no noticeable after-effects.

Anger has about the same characteristics as annoyance except that it lasts much longer and is more intense. Anger in college students has been extensively investigated by Gates and by Meltzer, whose data are complete enough to merit detailed discussion.<sup>10, 11</sup>

Meltzer had students at Oregon State College keep an accurate record of their anger outbursts during a week's time. These results were found to agree with similar ones previously obtained by Gates, using as subjects a group of girls at Barnard College. The technique used was that developed by Gates, thus being constant for the two investigations so that comparisons would be valid. The number of outbursts of anger ranged from none to fifteen a week. Men averaged 39 per cent more outbursts than did women. There was little difference between sorority and non-sorority women in frequency of reported anger and practically no difference between men living in and those living outside fraternities. Thus there is no evidence from this study that living in a "house" produces a better emotional adjustment than does the life outside. Monday and Tuesday were the days of most frequent outbursts for the organized men and women, and Friday and Saturday were calmest. The independent men and women were more easily angered on

Saturday than on Monday. With both groups Sunday was pretty free from outbursts of anger. The difference between the organized and unorganized groups in the temporal course of susceptibility to anger suggests that the thwarting of desire for social activity might play an important rôle. Over the weekend, the organized groups engage in social activities not enjoyed by the independents. Presumably the dances and parties of the fraternity and sorority groups lessen the emotional tension which is built up throughout the week. It is noteworthy in this connection that Sunday, the traditional day of rest, was for the entire population included in the study freer from outbursts of anger than any other day in the week.

Outbursts of anger were much more frequent during the hour before a meal than during the hour following. This result indicates that an organic tension will predispose a person to anger, while the contentment which follows a meal is conducive to peace of mind and tranquillity. Anger occurred more frequently during periods of tiredness or sleepiness than at other times. Fifty-one per cent of the outbursts were brought about by the thwarting of self-assertion by other persons; thirty-five per cent of the outbursts were elicited by the thwarting of self-assertion by things; about six per cent of the incidences of anger grew out of thwarted organic activities; while another eight per cent occurred in complex situations which could not easily be analyzed.

The results of Meltzer's study, taken as a whole, illustrate that, in our culture at least, anger is a social affair primarily—a reaction to frustration by persons rather than things—and that organic tensions predispose one toward it.

The rules of behavior to be derived from our knowledge of anger are simple: Do not attempt to settle a difficulty when you are tired, sleepy, or hungry. During the week provide yourself with interesting activities which will permit the relaxation of tensions, which mount at that time.

*Shame.* Much has been written about the psychology of shame, for this is an everyday emotion, common to all men. MacCurdy, an eminent English psychiatrist, holds that shame is of biological importance in that it protects people from being surprised by an enemy when engaging in such behavior as eating, sleeping, sexual

intercourse, or excretion.<sup>12</sup> In a primitive way of life, such necessary activity renders the individual at a disadvantage should an enemy come upon him. The sense of shame and the accompanying desire to seek cover are regarded as protective behavior which have caused people possessing them to survive while others, lacking this characteristic, have been eliminated in the struggle for existence. MacCurdy points out that it is not the acts themselves which we regard as shameful so much as the public performance of them. The appearance of shame in connection with acts which are not thus potentially physically dangerous if done publicly must, according to this theory, result from conditioning.

Why children have no sense of shame during their early months and years is not clear. It is quite possible that shame is a native reaction which must mature; it is equally possible that the feeling and behavior of shame are brought about largely by conditioning. Thus far in this connection psychologists have not been able to isolate the two factors of maturation and conditioning.

The cultural anthropologists, social scientists who study and compare the cultures of different societies, tell us that shame-provoking situations vary widely among the different cultures. Shame seems to be largely learned, according to this evidence, and is simply a fear reaction. We are ashamed of the things that our particular culture disapproves of. In other words, according to this view we are afraid of the social consequences of being caught doing something we have learned is "bad."

One of the most common sources of shame reported by the fifty-one college students referred to on p. 105 was the breach of some social convention. Several students reported shame occasioned by the unconventional behavior of a friend. One of the subjects reported intense feelings of shame when his friend applauded loudly and alone during a scene in a motion picture. Once the reaction of shame has become connected with acts which ought to be privately performed and are disapproved by people when performed in public, that reaction can transfer to any socially disapproved act. When your friend claps loudly and alone at the wrong time, he does nothing innately shameful, but the unconventionality of his behavior gives him and you a feeling of shame. Many unconventional acts are considered shameful. There are

enough of these to condition the shame reaction to any unconventional act or situation.

*Jealousy.* Jealousy is not frequently reported by college students. This fact may have its explanation in the natural reluctance to admit experiencing an emotion generally considered so base. There is, however, the possibility that college students, who are, after all, a rather fortunate and comparatively unfrustrated group, rarely experience jealousy. In the study of the fifty-one college students, jealousy, when it came, was reported as occurring like worry during the introspective hours of the evening when students tire of studying. It is interesting that somewhat fewer than one-half of the men students who reported emotions of jealousy attributed them to frustration in love. Failure to excel other men in sports, scholarship, or activities was a somewhat more frequent cause of the jealous emotion.

There are many other human emotions. No one is certain how many. Simple human emotions blend into one another. Complex human emotions are compounded of simpler ones in various and often unknown amounts. As we have seen, an inventory of human emotions includes lust, fear, anger, elation, and grief as basic patterns; romantic love, patriotism, hate, zeal, awe, contempt, and many others are composites of the more basic. In life it is often hard to distinguish one from the others.

### *Moods in daily living*

An emotion is fairly brief, although some of Meltzer's subjects reported outbursts of anger lasting as long as two days. Such long drawn-out emotions, whether anger or some other emotion, are usually called moods. A mood is less intense than an emotion and lasts much longer. When a mood is relatively permanent throughout life, we call it temperament. Our moods vary with the day of the week and the hour of the day as well as with the season. Springer and Roslow recently conducted a survey of the moods of male college students, patterned after an earlier study of Cason.<sup>13, 14</sup> Their results agreed essentially in the following details:

Students feel bluer during the first and last half hours of the day than at other times; they feel "lower" on Mondays than on any other day of the week. Happiness of mood is highest in spring

and summer, lower in the fall, and reaches the bottom in January, February, and March.

Hersey followed the course of moods of twelve working-men in relation to efficiency at work throughout an entire year.<sup>15</sup> The investigator spent the entire working day and a good portion of the time outside of working hours with his subjects. Changes in mood were recorded by use of a numerical scale. They ranged from the depressed moods described as worried and apprehensive through neutral states to the positive moods described as elated, happy, hopeful. A mood of the positive sort coincided with increased production in 31 per cent of the cases; with decreased production in 11 per cent of the cases; with no change in production in the remainder. Hersey found a definite periodicity or fluctuation of mood which could not be accounted for on the basis of environmental changes or apparent physical condition. The cycle of change from trough to trough ranged from three to nine weeks among the twelve subjects, but in no case did the length of the cycle for a given person vary from his own average by more than a week. The implications of these findings for daily living are simply that we should expect daily and seasonal fluctuation in our moods and should not worry when they occur. If, of course, the fluctuations come too fast or if the difference between the crest and the trough seems all out of proportion, the individual should consult with some competent psychologist or psychiatrist.

### *Our emotions as drives*

There is no sharp line setting off the emotions from the physiological drives previously discussed. Some psychologists look upon pain-avoiding behavior as an emotion. Others list it among the physiological drives. If any distinction is to be made between emotion and drive, it must be drawn with reference to the time element. The order of events in emotion is: conscious awareness of the significance of some situation or object; internal and external changes; awareness of those changes. In motivated behavior the situation is rather different: internal changes come first; perception of object as adequate to relieve the motivating condition comes second; then comes satisfaction; and finally, inaction. The emotion usually starts with an external object; the physiological

drive with an internal condition. It is true that the internal conditions in drives and emotions are frequently very much alike as viewed by naked-eye methods. For example, the visceral changes and blood conditions in pain, anger, cold, and fear are about the same. Two of those behavior patterns (pain and cold) are drives, and two of them (anger and fear) are emotions.

Emotions can act as drives in so far as drives involve the intensification or direction of the reaction to some present external stimulus situation. In fact, the social importance of emotion resides entirely in how the presence of the emotion affects the behavior of the individual with regard to the objects of his physical, and the persons of his social, environment.

### *Ways of Looking at Emotion*

SO FAR in this chapter it has been necessary to view an emotion sometimes from one point of view and sometimes from another. This section will summarize these different viewpoints and show how emotions may be classified accordingly.

Human emotions may be described from three points of view: (1) in terms of the external situation or stimulus which arouses the emotion; (2) in terms of the subject's reports on his conscious experience; and (3) in terms of the observable external and internal reactions which make up the emotion (behavior pattern).

#### *Emotions from the stimulus point of view*

Dangerous situations (such as the fire in the example at the beginning of the chapter) are stimuli to fear; restraint, a stimulus to anger; sexual stimulation, to lust; success, to elation; failure or denial, to grief (pp. 100-104).

Mere knowledge of the external situation confronting the individual does not, however, always permit accurate description of the resultant emotional response. To you a particular person could be an object of love; to another, one of hate. The conditioning of the individual in the past has an important bearing on his present emotional reactions. Of two persons put in the same situation, one may have no adequate ready-made response and



show intense emotion; the other may show no emotion because he is able to respond to the situation routinely.

### *Emotions as conscious experiences*

We are a little more interested in what the other fellow does than in how he feels as he does it, but we are greatly interested in our own inner world of experience. A human being devoid of all emotional life would become very much like a robot stiffly performing the routines of living. Were we to omit the subjective emotional aspect of the other fellow, much of interest would be lost; but if one were to be stripped of his own inner experience, life would be as dull and colorless as a faded lithograph.

No normal human being doubts the reality of emotion as a conscious experience. When you act angry in an anger-provoking situation, you *feel* angry. Introspective description of emotion is the reporting of the various sensations and feelings of pleasantness and unpleasantness experienced. This method has been employed with value in analyzing complex emotions into their component parts. The visceral strains, their intensity and localization, are reported in detail, as are all of the sensory and other conscious elements of the total experience.

Introspection has its limitations here because the introspections of different individuals must be reported in exactly the same language to be directly comparable. This is hard to do, since it is difficult to give specific names to subjective phenomena. (We would not have words enough to describe our conscious emotions even though we could tell them apart—an impossible task because one shades into another imperceptibly.) When the thing to be described is an external object, you can look at it, and so can everybody else. You all agree to call it by a particular name. In fact, the society in which you live has already decided this for you for most of the external objects you will ever see. But when the thing to be described takes place within us, we can never be quite certain that it is exactly the same thing that goes on in the other person. Two persons may call the same piece of paper green, but we cannot be entirely certain that they have the same inner experience when they do so.

William James said that he would just as soon read the geo-

logical descriptions of all the stones on a New England farm as waded through the verbal descriptions of the various varieties of emotion. We must not, however, neglect the method of introspection. It is the only way we have of studying what goes on in the consciousness of others. The experimental psychologist in searching for patterns of emotion uses the introspections of his subjects as basic data.

In general, the poets and the writers of prose have succeeded better than the psychologists in describing emotions as conscious experience. Let us take, for example, Charlotte Brontë's description of terror in *Jane Eyre*. The child Jane is shut up in the awful red-room as punishment. It is dark and cold; and it is the room in which Mr. Reed died.

Daylight began to forsake the red-room; it was past four o'clock, and the beclouded afternoon was tending to drear twilight. I heard the rain still beating continuously on the staircase window, and the wind howling in the grove behind the hall; I grew by degrees cold as a stone, and then my courage sank. . . . I sat looking at the white bed and overshadowed walls—occasionally also turning a fascinated eye toward the dimly gleaming mirror. I began to recall what I had heard of dead men, troubled in their graves by the violation of their last wishes, revisiting the earth to punish the perjured and avenge the oppressed; and I thought Mr. Reed's spirit, harassed by the wrongs of his sister's child, might quit its abode—whether in the church vault or in the unknown world of the departed—and rise before me in this chamber. I wiped my tears and hushed my sobs, fearful lest any sign of violent grief might waken a preternatural voice to comfort me, or elicit from the gloom some haloed face, bending over me with strange pity. This idea, consolatory in theory, I felt would be terrible if realized; with all my might I endeavored to stifle it—I endeavored to be firm. Shaking my hair from my eyes, I lifted my head and tried to look boldly round the dark room; at this moment a light gleamed on the wall. Was it, I asked myself, a ray from the moon penetrating some aperture in the blind? No, moonlight was still, and this stirred; while I gazed, it glided up to the ceiling and quivered over my head. I can now conjecture readily that this streak of light was, in all likelihood, a gleam from a lantern, carried by someone across the lawn; but then, prepared as my mind was for horror, shaken as my nerves were by agitation, I thought the swift-darting beam was a herald of some coming vision from another world. My heart beat thick, my head grew hot; a sound filled my ears, which I deemed the rushing of wings; something seemed near me; I was oppressed, suffocated; endurance broke down; I rushed to the door and shook the lock in desperate effort. . . .

### *Emotions are responses*

In emotions two kinds of physical responses are involved, external and internal. Although the external features of emotion are much easier to observe than the internal, they do not constitute the emotion. An emotion is a complex of external and internal responses plus an awareness of the significance of the emotion-provoking situation and an awareness of the internal and external responses themselves.

*External response.* The external responses of bodily and facial muscles play a direct rôle in moving physical objects of the environment (hitting an enemy with fist or missile) and in influencing other members of the social group (smiling, scowling, laughing).

The description of human emotions on the basis of external response is not at all perfect. Emotional responses can be classified in terms of destruction, approach, retreat, or stopping of response.

A. Destruction. In anger, for example, attack is the typical behavior. In the lower animals and in uncivilized man this attack is physically destructive. An angry animal or uncivilized man throws himself upon his enemy, biting, scratching, choking, hitting, spitting, snarling, according to his species. In civilized man the attack is more often symbolic. Words take the place of blows; physical injury gives way to attempts to lower the prestige of the enemy in the eyes of his fellows. Or perhaps we pound the desk, wishing it were our enemy's face. The end result of anger is, nevertheless, essentially the same in man and beast, i.e., real or symbolic destruction.

B. Approach. In lust the essential response is approach. The biological function of approach to the stimulus object is to permit further stimulation. Here again we find that the behavior of civilized man differs from that of the lower animals. Words may take the place of acts in the love behavior of man, whereas vocalization is much less important in animals, although we must not overlook the fact that recognizable mating cries and songs are employed by the mammals and by birds.

Elation is essentially also an approach reaction. It is the emotion which follows success in any activity. In elation we review our

exploits and relive the victory. We tell ourselves and our friends about it and try in many ways to keep the situation before us.

c. Retreat, or flight. Fear typically involves flight. Flight from a dangerous situation is often the best adjustment. The flight may be physical or symbolic. Suppose that in crossing a pasture you hear a commotion and look up to see an angry bull bearing down upon you. You run. Physical flight of this sort is typical even of civilized man when confronted with a dangerous situation which will not respond to words. Suppose, however, that the dangerous situation is embodied in the power of another person. Johnny has been disrespectful to his teacher. The teacher has become impatient. Johnny's disrespectful attitude may at some point give way to the fear reaction. In that case the fear reaction, physical flight being more or less out of the question, takes the form of words. "A soft answer turneth away wrath." An apology and a promise to do better in the future banishes the danger of punishment.

In certain of the lower animals the flight response may take the form of the death feint. In the death feint the animal stops all overt activity and lies in a heap almost motionless. It is significant that the death feint is found in animals whose natural enemies are birds of prey which do not eat dead flesh. The opossum which plays dead when in danger of being devoured by the eagle is fleeing the situation just as much as if he actually ran away. The death feint is a response of extreme fear, not of mild startle. There is some evidence that man retains a remnant of the death feint from his evolutionary forebears. Some persons will faint in cases of extreme danger. The words *feint* and *faint* even sound alike.

d. Stopping of response. Gloom (in more severe form called grief) is never adaptive and does not involve destruction, approach, or retreat. In such emotion the response is a stopping of active response. In the extreme form the individual refuses to respond to even the most potent of stimuli. There are patients in mental hospitals who are too sad to eat and who must be forcibly fed. The depressed reaction of gloom is the least wholesome of the emotions. Anger accomplishes destruction of the enemy; fear brings escape from danger; love brings contact with the loved object; gloom brings nothing. Since gloom does nothing, the situation which caused the gloom in the first place is likely to endure

until something outside the individual alters it or until the individual deliberately plunges himself into some activity.

*Internal response.* The other kind of physical response involved in emotion is the vast complex of internal or visceral responses. If it were possible to look directly into the blood stream of the angry or fearful individual, or, in fact, of the individual suffering any violent emotion, you would discover that one of the endocrine glands is pouring its secretion into the blood stream in excessive amount. This secretion, traveling through the blood stream to the various parts of the body, is responsible for many characteristics of strong emotion. Under its influence the liver releases stored sugar into the blood; chemical changes occur which cause the blood to clot more quickly; the walls of the stomach become blanched and pale as blood is forced away and into other parts of the body, particularly the muscles of the leg, arm, and trunk. Blood pressure rises in strong emotion, the pulse beats more rapidly and more vigorously, the air passages into your lungs enlarge to admit more air. The pupil of your eye enlarges so that more light may enter. Sweat breaks out all over your body, particularly on the inner surfaces of the hand. The temperature of your skin may rise or fall several degrees. All these changes are important or incidental parts of a general bodily preparation for emergency activity—for fight or flight or other appropriate behavior.

A. Measuring visceral changes in emotion. Gaskill took records of breathing, pulse rate, and blood pressure in a group of fourteen men and sixteen girls of college age subjected to various emotional situations.<sup>16</sup> These included, among others, the reading of a short short-story with a surprise ending; a large bull snake which was "accidentally" allowed to escape; pistol shots; mighty blasts from an automobile horn; sudden flashes of light; brief motion-picture scenes of bathing beauties; a beautiful mountain scene; a stage-coach hold-up and other Western super-thrillers; and two lovers' lengthy embrace. The films were new to the subjects, and many of them were scenes cut from commercial films by the censors as too immoral for public consumption.

Many evidences of clear-cut visceral changes appropriate to particular emotions were obtained from analysis of the records.

The time required to breathe in, divided by the time spent in breathing out (inspiration-expiration ratio), dropped in response to disgusting situations and rose in response to stimuli which gave rise to noble sentiments. This result showed most clearly in the realm of sexual stimulation. Crude sexual emotions accompanied a drop in the inspiration-expiration ratio, while stimuli which gave rise to sentiments of idealized love produced a rise in the inspiration-expiration ratio. Fear-provoking situations also showed a lowering of the inspiration-expiration ratio. Gaskill found that changes in the rate of the pulse-beat were small but tended in the direction of increased action during disgust and crude sexual stimulation. Breathing was shallower in disgust than in fear. In extreme fear the inspiration-expiration ratio increased, breathing became deeper and more variable, and the heart alternately went faster, then slower.

Witnessing scenes of lingering embraces produced highly variable changes within the same subject, who seemed to alternate between the type of change that comes in undergoing the experience of beauty and that which comes in disgust.

B. Visceral changes are involuntary. The visceral responses in emotion differ from the external responses in a very important manner. The internal components of emotion are not subject to voluntary control. Practice before the mirror, if diligently executed, will eventually bring considerable voluntary control of the facial muscles. Some athletes, for example, strive never to show emotion or exertion no matter how exultant they may be over victory or how depressed by defeat. These people, like the gamblers of the Old West, pride themselves on their "poker faces." But even the poker-faced individual is unable to control the widespread internal upheaval in emotion. This fact is taken advantage of in the use of the "lie detector."

c. The lie detector. The lie detector is no mysterious mind-reading machine. It is simply a collection of instruments which measure the intensity of the various visceral emotional responses which occur as the subject is questioned by the operator of the detector. The skilled liar learns to tell a story which, although untrue, is logically coherent. It "sticks together." He learns to control the muscles of his face and skeleton so completely that the observer



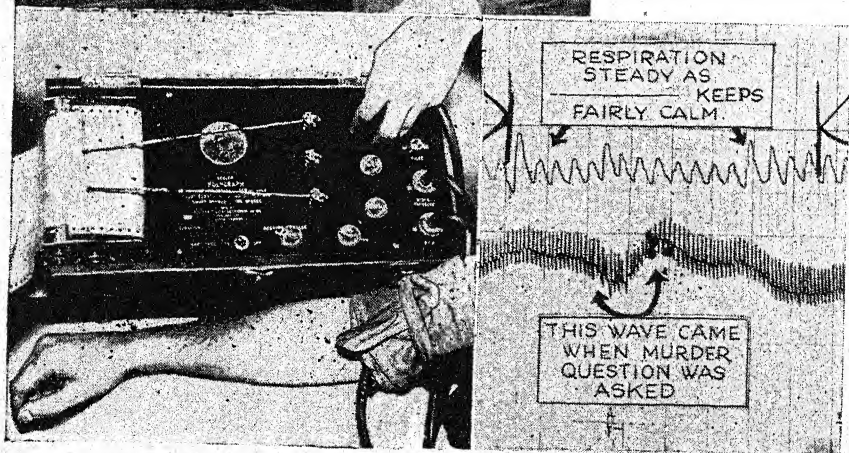
can see no outer change in response to any accusations. Literally he learns to lie without flickering an eyelash. The control of the visceral responses, however, is another story, this time one of defeat, for no human being has yet learned to suppress completely all the inner manifestations of emotion.

The consciousness of guilt engenders a vague fear reaction. Consequently, anything which is true of fear in general is true of this sense of guilt. Certain questions produce emotion; others do not. By analysis of the nature of the questions in relation to the degree of emotion they produce, the skilled operator of the lie detector is able to determine the suspect's guilt or innocence.

How accurate is the lie detector? Can a man who understands it "beat the game"? These are fundamental questions whose



FIGURE 18. *Leonarde Keeler, one of the exponents of the lie detector, is shown using the machine on a suspect. The reactions pictured below are those of another case, a convicted murderer. These confirmed previous evidence of guilt; his petition for a reprieve was denied, and within a few hours he was electrocuted.*





answers would take us deeply into the field of the physiological psychology of the emotions, an extremely complex study in which physiologists and psychologists work in close coöperation. Results to date indicate that the evidence of the lie detector is fully as reliable as some other types of evidence which are traditionally admitted in court. At the present time its greatest use is in the hands of the detective or the public prosecutor's staff. When the lie detector yields psychological clues that can be followed up by traditional detective methods leading to the preparation of evidence of the sort that all jurisdictions will accept, the chance of error has been greatly lessened, and the apparatus has been of great social service. The lie detector, like many another good thing, is not fool-proof. For the present, it is best to be conservative in our attitude toward it.

### *Patterns in Emotional Expression*

**D**OES each emotion have its own pattern of facial and vocal expression, recognizable even when the stimulus situation and the internal responses are not known?

#### *Patterns of facial expression*

Ask almost anyone whether he can recognize emotion in others by their facial expressions and he will say "Of course" and think it a ridiculous question. Is he justified in this attitude?

*Facial patterns of emotion in babies.* M. and I. Sherman conducted an experiment to investigate the extent to which emotions of babies can be identified on the basis of facial expression alone.<sup>17</sup> A group of college students were shown motion pictures of emotional and organic reactions in babies. They were told specifically that only four situations with their accompanying emotions were included: hunger due to deferred feeding; fear aroused by sudden dropping but with no pain involved; pain from being pricked by a needle; anger aroused by restraint of movements of the head. The response to deferred feeding was considered an emotion as was the response to a needle prick. The responses to being dropped and to being restrained are commonly accepted as fear and anger, respectively, and are true emotions. The ob-

servers were shown the pictures of the responses but not the stimulus situations. Table 4 gives the results. The percentage of correct judgments is in italic type.

TABLE 4: *Judgments, by Students, of the Character of Emotional Responses of Infants as Shown in Motion Pictures*

| EMOTION       | % SAYING: |               |             |              |             |                   |
|---------------|-----------|---------------|-------------|--------------|-------------|-------------------|
|               |           | <i>Hunger</i> | <i>Pain</i> | <i>Anger</i> | <i>Fear</i> | <i>Don't Know</i> |
| <i>Hunger</i> |           | 10            | 49          | 26           | 15          | 0                 |
| <i>Pain</i>   |           | 18            | 20          | 20           | 33          | 9                 |
| <i>Anger</i>  |           | 18            | 23          | 31           | 18          | 10                |
| <i>Fear</i>   |           | 21            | 19          | 27           | 30          | 3                 |
|               |           |               |             |              |             | TOTAL             |
|               |           |               |             |              |             | 100               |
|               |           |               |             |              |             | 100               |
|               |           |               |             |              |             | 100               |
|               |           |               |             |              |             | 100               |

Only 10 per cent of the observers named the hunger response correctly, 49 per cent calling it pain, 26 per cent calling it anger, and 15 per cent calling it fear. In the case of the pain response, 18 per cent called it hunger, and 33 per cent called it fear; only 20 per cent gave it its correct designation. The observers did a little better with the two proper emotions. In the cases of anger and of fear, the number of correct identifications of the emotion was slightly greater than chance. The chance expectancy, the number that one would get correct by mere guessing, would, of course, be 25 per cent.

The poor ability of college students to judge the two emotional reactions of infants as revealed by this experiment has many explanations. In the first place, the emotions investigated were both of the sort which adults would call unpleasant. Since they possess the common factor of unpleasantness, you would expect them to be confused. The reaction to a mother's caress would probably not be confused with that to being dropped or restrained.

A second possible source of error lies in the Shermans' assumption that the four situations always bring out in babies the four particular emotions named. This may or may not be the case. We cannot possibly know. The experiment would have been more conclusive if the observers had been told to name the responses themselves rather than to fit them into categories arbitrarily allowed. Or even a simple check to see whether the observers could

recognize the four types of responses as the same or different would have indicated more accurately whether or not there are specific recognizable facial patterns in infants.

Third, the problem of the clarity of the motion pictures arises. A motion picture, even as taken by a professional photographer, rarely reveals the details of facial expression unless the subject is "made up." The next time you go to a motion picture, notice how expressionless are the faces of the central figures shown in newsreels, even in the close-ups, as compared with the expressiveness of the actors' faces in the feature. The point is that the actors have been carefully made up so that the expressions of the face will register clearly. Had this been done with the babies in the Shermans' experiment, the observers would probably have made a better showing. Another point to be kept in mind is that the judges in the experiment were untrained. At any rate, we are safe in concluding that anger and fear can be identified slightly better than chance would allow from seeing a motion picture of the response without previous knowledge of the nature of the stimulus. The more refined the methods of observing the responses, the greater would be the accuracy of identification.

There is still a fourth point to be added. Babies are immature in neural and muscular coördination as compared with adults. Nor have they had time to learn specific expressions for specific emotions. A fairer test of the hypothesis that each emotion has its specific facial expression would make use of adults as subjects.

*Facial expression of emotion in adults.* Recall your last telephone conversation concerning some issue or misunderstanding of more than ordinary significance. Did you have the feeling that the difficulty could have been adjusted much more effectively face to face? Why? In normal social conversation each speaker is able more or less successfully to follow the effects that his words have on the other participant by careful observation of the other's face. The face of a hearer serves as a barometer of the emotions, warning a speaker that his words are perhaps a bit too strong or reassuring him that his listener is not displeased.

There are, however, significant limitations of our ability to read the facial expression of emotion. Just how accurate are facial expressions as the language of emotion? The answer to this ques-

tion will depend upon whose facial expressions are being observed and upon who is doing the observing. The ordinary person shows facial expressions which cannot be judged very accurately by the ordinary person; the professional actor can register emotions which will be interpreted with a high degree of consistency by all observers. The facial expressions of the child are more difficult to interpret than those of the adult.

Landis conducted an experiment to determine whether or not emotions reported by normal human beings are accompanied by definite and easily recognizable facial expressions.<sup>18</sup> Twelve women, eleven men, and one boy served as subjects. Each was stimulated by smelling a bottle of ammonia, falsely labeled syrup of lemon; looking at pornographic pictures; cutting the head off a living rat or seeing it done; receiving a severe electrical shock; looking at pictures of people with skin diseases; telling a lie. After each stimulus was presented, photographs were taken of the facial expression, and the subjects were asked to give their introspective report as to what emotion had been aroused in them. Evidence that real emotions were evoked was yielded by the outcries, profanity, and other exclamations of the subjects. Stimulus situations arousing disgust, anger, astonishment, and sexual excitement were frequent enough to permit detailed analysis of the accompanying facial expressions. Landis reports that the photographs showed no evidences of facial expressions characteristic of a particular emotion. Landis, however, was looking for obvious and easily recognizable patterns of the facial muscles. His failure grew out of that fact as was shown by Davis, who several years later analyzed the data reported by Landis.<sup>19</sup> Davis's analysis of the pictures showed smiling in cases of reported pain in 7 per cent of the observations, while smiling occurred in 60 per cent of the emotional responses reported as sexual. A particular muscle group of the face was found to be involved in 3 per cent of the cases of reported sexual emotion and in 50 per cent of the cases of reported pain. Thus we can conclude that in a particular emotion there is a *tendency* for certain muscles or muscle groups to be involved which are not involved in another.

Davis found that situations judged to be highly similar showed a high degree of similarity of facial expression. For example, the



FIGURE 19. *In several cases of these youngsters watching a puppet show, facial expressions may well be matters not of certainty, as commonly assumed, but of debate.*

situation of listening to classical music gave rise to facial expression patterns which bore very little resemblance to any other situation except those assumed when listening to jazz. Three situations involved sexual stimulation: viewing photographs of artist's models; looking at pornographic pictures; reading case histories of sexual problems. These three situations gave rise to emotional responses which tended to a very high degree to involve the same facial muscles. It is interesting to note that the facial expression pattern assumed while looking at pictures of loathsome skin diseases closely resembled those which occurred in the three sexual situations. This observation strongly suggests that a basic pattern of disgust runs through the four.

The work of Landis and of Davis when taken together shows us that, while no all-or-nothing patterns of facial expression are to be found in each of the emotions, there is some tendency for certain muscles to be involved more frequently than others in the facial expression of a particular emotion. The fact that Davis succeeded in finding facial patterns which were recognizable where Landis failed proves that though individual differences are great

there is a central core of common elements which can be teased out by statistical methods.

Individuals differ in the facial expression of emotion. The same individual also differs from time to time, but the differences within an individual are probably much less than the differences between individuals. Long association with a particular person permits us to detect and recognize his emotions from his facial expression when both the stimulus situation and the response are known to us. With strangers, we are not quite so successful.

However we may do it, there is no doubt that the adult can read emotions from facial expression as shown in photographs. To investigate the judgment of emotion from the facial expressions of emotion aroused naturally under conditions of everyday life, Munn selected 14 "candid-camera" photographs from back issues of picture magazines.<sup>20</sup> From these, two sets of lantern slides were made. The slides of one set included everything in the original picture. The second set contained only an enlargement of the face selected for study. The slides containing the facial expressions alone were submitted to a group of 90 psychology students instructed to judge the subject's emotional reactions. The instructions were to indicate in writing, "What emotion is being experienced by this person?" A week later these students judged the expression again but this time in its original setting. One minute was allowed for the interpretation of each expression. A list made up of the most frequent terms used by the group was given to a second group of 65 students from another campus. On being shown the first set of slides, this group was asked to indicate which term of the list best represented the facial expression shown. A new term could be inserted if none on the list seemed appropriate. The second set of slides was shown as soon as the first interpretations had been made.

There was marked similarity between the two judgments of each group as well as considerable agreement between the two groups.

Clearly apparent in both sets of data is some evidence of ability of the observers to discern the emotion underlying a given expression from the face alone. There was no instance of an expression predominantly judged as among the unpleasant emotions being interpreted as "joy" or "happiness."

How does the audience tell what emotions the actor is portraying on the stage or screen? In the first place the cinema- or theater-goer has the context of the play to guide him. The development of the plot leads him to expect certain emotions in a particular situation. There is, however, a second part to the answer. Professional actors study the art of conveying the impression that an emotion is being experienced. They exaggerate and conventionalize the distinctive elements of the facial expression patterns typical of a given sort of emotion and moderate those not characteristic. To facial expression they also add expression through the voice, bodily posture, and gestures.

*The eyes vs. the mouth as revealers of emotion.* In discussing the facial expression of emotion it is worth while to examine an old fallacy with regard to the relative importance of the eyes and mouth as revealers of emotion. Dunlap took pictures of college students who had been subjected to a series of different types of stimulation.<sup>21</sup> These pictures were mounted on the top of a card, and the experimental subjects were instructed to examine them and select from a list supplied by the experimenter the term most accurately describing each facial expression. The list of terms included *pleased, annoyed, interested, despondent, tired, resentful, disgusted, angry, frightened*, etc. After the pictures as a whole had been identified, copies of them were cut in two to separate the eyes and the mouth regions. The parts were interchanged in various combinations. "Pleased" eyes were coupled with a mouth of the same face expressing pain; eyes of a face showing pain were combined with the mouth of the same face showing pleasure. The two new photographs were then mounted below fresh, un mutilated photographs. These were given to a class of fifty men, who were asked to label the mutilated pictures to show which most resembled the upper picture in emotion expressed. It was found upon analyzing the data of this experiment that the majority of the judgments were made on the basis of the mouth. Of the two mutilated pictures the one showing the same mouth expression as the original was generally judged to be more similar to it than was the one showing the same eye expression as the original. These results weaken the widespread belief that the eyes are more expressive of emotion than the mouth.





The disappointing results of the Shermans' study on ability of superior adults to designate the type of stimulus situation does not prove the non-existence of innate patterns of vocal response which are specific to each stimulus situation arousing unpleasant reactions. Their results may merely indicate the inability of adults to analyze the emotional crying by "naked-ear" methods. Elaborate analysis of voice photographs might reveal unmistakable patterns. We must conclude with the Shermans, however, that in the life situation the much greater degree of accuracy of a mother in labeling the source of the baby's cry is due to the fact that the mother has logical expectations as to the probable cause. If, for example, feeding time is near and the baby starts to cry, she would conclude that the crying is due to hunger. Suppose that she knows the catch of a safety pin with which the infant's clothing is fastened is defective. Under such circumstances a cry would probably be attributed rightly to pain.

*The vocal expression of emotion in adults.* The adult human voice is richer than the face in varieties of emotional expression. The rising inflection means questioning, doubt, incredulity: "Are there' no' chairs'?" The circumflex ( $\wedge$ ) inflection shows sarcasm: "What' a' smart'" idea" that' was." A slow, dragging monotone expresses defeat and dejection: "I've lost my job." Rapid, staccato speech with much variation of pitch suggests the excitement of battle or athletic contest. The lapsing into a lower, slower, and softer voice is a trained speaker's trick which accentuates the value of the quick, high, and harsh voice of general excitement. The increase in pitch and loudness of the voice in anger is undoubtedly inborn. The vocal cords vibrate at a rate determined by the amount of tension on them. In anger there is a widespread increase in bodily tension. This means greater loudness and higher pitch in the voice. Quavering and stuttering, native expressions of the emotion of fear, are simulated by the actor to convey the feeling of fear to the audience. Somewhat akin is the *vibrato* of the singer. Vibrato is rhythmic pulsation of pitch and intensity of the human voice around a central tone. The rate of the vibrato differs with various singers and is deliberately cultivated to give emotional interpretations.

The average singing voice shows about six or seven pulsations

per second and covers a half step in pitch.<sup>22</sup> The vibrato also occurs in speech, but the trained artist uses it sparingly, even though the old-time spellbinder did not. About 20 per cent of adults have involuntary vibrato, but it is absent in boys of pre-adolescent years. Although the precise neuro-physiological basis of the vibrato is not understood, this phenomenon has some connection with the trembling in emotion. A record of trembling taken from the big toe of a well-known opera singer showed the same tremor frequency as was shown by the singer's voice at the same moment. Have you ever held a white mouse in your hand? Or a frightened squirrel? Recall how the animal was all aquiver. This quivering is close to vibrato. If squirrels and mice had voices we could listen to, we should undoubtedly find a vibrato.

The vibrato as a language of emotion has no specific, unchanging symbols or medium of expression. Its effect is to intensify the effect of other expressive movements and sounds.<sup>23</sup>

### *The Problem of Emotional Excess*

STRONG EMOTIONS were of great value to our primitive human ancestors, who faced a life which was brutal and raw before the coming of "the rules of the game" which we call civilization. Might was right until man's upright position gave him an advantage over the lower animals in freeing his hands for the use of weapons and other tools, until man's superior intelligence gave him tools with which to increase his effective strength.

Combat then meant injury or destruction to the weaker person. Man was frequently called upon to exert enormous strength, to perform great feats of endurance under penalty of death for failure. The cave-man's emotions gave him the strength, endurance, and fortitude required to survive in the brutal life of his time. As time rolled on, man's superior intelligence enabled him to build up a culture which gave him the upper hand over the less intelligent species. The development of language made education possible and thus lifted man above mere instinctive behavior, making it possible for the immediate experience of his race to be imparted to the young for better adaptation to conditions of life. Man developed tools which more than compensated for his in-

feriority in strength, speed, and endurance as compared with the jungle beasts against which he fought.

As man slowly rose from the bloody struggle for existence, his emergency emotions became of less and less use. Today anger, fear, and lust are frequently in the way. People are exploited through them into stupid ways of action. Mental hospitals are filled with individuals whose emotions get out of hand. Prisons contain many whose too violent emotions cannot be harnessed to work in social harmony.

There are certain modern practices which are decidedly injurious to the mental and physical health of the individual, particularly to that of the growing child. Among these should be listed motion pictures, radio programs, and adventure or love stories calculated to provoke intense emotional reactions of excitement, anger, fear, or lust.

### *Movie madness*

Psychologists are convinced that the excessive emotional excitement engendered by witnessing too thrilling motion-picture performances can only be bad for the child. Many is the mother who carelessly hands her growing boy a quarter to go to the matinée performance of a gangster or war picture and later wonders why the boy is so restless at night. "From the looks of his bed," she says, "he must toss all night. It's a wonder he gets any sleep at all. Why, just last night he cried out in his sleep as though something were after him. I guess his stomach must be out of order. Maybe we had better take him to the doctor."

Figure 20 shows an adolescent boy witnessing a thriller. Notice how his hands are gripping his clothing as though he were trying to "hold himself in." The same illustration also depicts the artist's interpretation of the phantasmagoria engendered in a little girl through excessive indulgence in exciting motion pictures.

As a part of a general program supported by the Payne Fund to study the effects of motion pictures on growing children, Dysinger and Ruckmick observed the degree of emotional excitement in children witnessing movie thrillers.<sup>24</sup> Films which have very little effect upon adults are sufficient to set the heart of the adolescent child racing. In general, boys are most affected by

scenes of conflict, while girls are more susceptible to emotional excitement produced by love scenes. Excitement built up by sensational motion pictures may bring about visceral upheaval which does not subside for more than twenty-four hours.

### *Exciting radio and comic strips*

It is by no means clear that the motion pictures are greater offenders than the radio and the comic sections of our newspapers. Pick up a copy of any newspaper and examine the comic strips. In most instances you will find a preponderance of too-thrilling adventure. Pirates, air-raids, shipwrecks, kidnappings, gangsters, and mysteries take up a significant portion of the space. The same thing is true of certain of the children's hours on the radio. Yet it lies within the power of the parents of children to curb this unfortunate practice. The sponsors of radio programs, the producers of motion-picture films, and the publishers of newspapers are not entirely to be blamed. They are merely satisfying what they feel to be a popular demand. They are decidedly receptive to any communication from parents showing that there is also a demand for saner and less stimulating materials for the entertainment of children.

### *The rôle of the emotions in health and disease*

Medical authorities have long agreed that illness and uncontrolled emotionality go together and that health and happiness are parts of one pattern.<sup>25, 26</sup> Now it appears that in many cases illnesses are actually caused by an excess of unbridled emotion. Kaplan, a physician, points to evidence indicating that persistent and repeated emotional disturbances in a patient endowed with a weak nervous system may so overstimulate the alimentary tract that organic lesions may develop. It is Kaplan's belief that uncomplicated peptic ulcers, unresponsive to medical treatment, are probably all of nervous origin, with psychotherapy needed to cure them.<sup>27</sup>

Kaplan also presents a case history of spastic constipation and duodenal ulcer, apparently caused by emotional factors where improvement in the patient's condition was noted only after his emotional disturbances had been corrected. Thus emotional instability is seen to be a factor both in causing such ulcers and in



## Movie Madness

FIGURE 20.



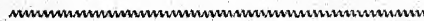
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hindering their cure. This interference is apparently, equally effective with ulcers caused by factors other than emotion.

In another study by Chappell, Stefano, Rogerson, and Pike, it was found that emotional disturbances accomplish this interference by bringing about a hypermotility, spasm, flaccidity, and decreased blood supply to the gastro-intestinal tract.<sup>28</sup> The emotional hyperactivity must be reduced before the body can cure itself readily. Fifty-two patients having the characteristic symptoms of peptic ulcer were divided into two groups. The experimental group of thirty-two were trained daily for six weeks in the restraint of worry, discussion, effort, and self-suggestion. A control group of twenty patients was trained for similar periods in non-psychological subjects. Both received standard diet under medical supervision. After only three weeks of training, thirty-one of the experimental group were free from subjective symptoms. Twenty-six of them remained symptom-free after the end of the treatment. All the patients of the control group were made free from symptoms as a result of diet and medication, but within two weeks after the expansion of diet, symptoms recurred in eighteen cases out of the twenty. Not only did the psychological training aid in the initial amelioration of symptoms, but it aided in keeping the patient in good health after the training was completed.

Although it is extremely difficult to distinguish or separate cause and effect, physicians are coming to realize more and more that emotional strain can very definitely work against success in treating tuberculosis, heart disease, diabetes, and epilepsy. The effects of uncontrolled emotional outbursts are particularly bad in tuberculosis, since the patient cannot engage in vigorous physical exercise as a means of working off his emotional jag. A patient who is emotionally uncontrolled needs a solid program of mental hygiene as well as the purely organic treatment. The patient must be helped in adjusting himself, his ambitions, and his activities to his illness. He must be taught not to permit himself to indulge in emotional outbursts which are injurious and avoidable.



The human infant is born with a few simple responses. These are the basic materials from which our complex emotional struc-



ture emerges. Learning alone, however, does not tell the whole story of the growth of the emotional life. Emotional behavior matures in the absence of opportunity to learn. Emotions in their strongest form are emergency reactions. As such, emotions can increase efficiency, although sometimes they become too strong to be adaptive. The disruptive effect of strong emotions is greatest when we are engaged in highly skilled work or in thinking.

Emotions are likely to be more intense at certain times than at others. We should make allowances for such emotional fluctuations in ourselves and in others. Our emotions are normally expressed by our outer behavior, such as the facial expression and the voice, responses which with practice can be controlled. Our inner expressions of emotions are, of course, harder to control. Excessive indulgence in emotional activity when there is no biological need for such emotion may be greatly disadvantageous to mental, even to physical health. Many of our modern practices are decidedly injurious to the individual, particularly to the growing child.

### *Recommended Readings*

CANNON, W. B. *Bodily Changes in Pain, Hunger, Fear and Rage*. Appleton-Century, 1929.

Measurement and description of the bodily changes in emergency situations.

DUNBAR, H. F. *Emotions and Bodily Changes*. (2nd Edition.) Columbia University Press, 1935.

A review of the significant contributions to the study of the emotions.

DYSINGER, W. S., and RUCKMICK, C. A. *The Emotional Responses of Children to the Motion Picture Situation*. Macmillan, 1933.

How motion pictures affect the emotions of the young.

GARDINER, H. M., METCALF, R. C., and BEEBE-CENTER, J. G. *Feeling and Emotion*. American Book Company, 1937.

A historical and critical study of the theories of emotion.

LANDIS, C., and HUNT, W. *The Startle Pattern*. Farrar and Rinehart, 1939.

Comprehensive studies of the startle reflex in all sorts of human subjects.

LUND, F. H. *Emotions; their psychological, physiological and educative implications*. Ronald Press, 1939.


Stresses the importance of the emotions in daily living.

MARSTON, W. M. *The Lie-Detector Test*. Smith, 1939.

The inventor of the lie-detector tells what it will and will not do. The last chapter is an operator's manual.

RUCKMICK, C. A. *The Psychology of Feeling and Emotion*. McGraw-Hill, 1936.

Most comprehensive available summary to date.



*"It is not the absence, but the mastery of our passions  
which affords happiness."* MME DE MAINTENON

*Worcester*

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CHAPTER 5

*Worcester*

## CONTROL OF EMOTIONS

*What to do about your emotions. The best control comes through learning desirable emotional habits, unlearning the undesirable ones, and avoiding emergency situations; when too strong emotion comes, try to laugh it off or work it off.*

Do you get stage-fright? Do you find it difficult to start a conversation with a stranger? Do you frequently find yourself worrying over some humiliating experience? Are your feelings easily hurt? Do you sometimes break into tears at the slightest provocation? Do your friends think you are grouchy? Have you ever lost your head in a friendly bridge game and thrown the cards on the floor?

All these are signs of emotional instability, signs of uncontrolled emotion. Emotional behavior of this sort is much more common than desirable. Too many individuals go through life handicapped by uncontrolled emotionality.

Have you ever seen a young child in a temper tantrum? Have

you ever seen a child cry and whimper in his bed at night, after the light is turned out? Why do certain children submit with good grace to having their hands and faces washed at bed time, while others scream, kick, hit, and bite, or even shout "I hate you" to the tired mother? Do you know a child whose life is made miserable by fear of harmless objects, such as a playful cat or dog? These manifestations of uncontrolled and badly directed emotion in children are particularly deserving of our attention, because numerous experiments and observations made by psychologists leave little room for doubting the importance of childhood as a period in which wholesome emotional behavior should be acquired.

How can these emotional handicaps in the lives of children and adults be prevented? What can we do to keep our bad emotional experiences from becoming worse? What can we do to get rid of them entirely? These are some of the questions which we will attempt to answer in this chapter.

### *Emotional Control through Training*

**I**N THE FIELD of emotional control, as elsewhere, *prevention* of maladjustment is better than cure. The best way to control hampering emotions is never to have them in the first place. Emotional education in childhood is fully as important as learning the three R's. Parents and teachers who control the emotional education of the child can, by their efforts, produce a happy or an unhappy adult.

What of the improperly trained person? Is his hope for emotional adjustment in vain? Fortunately, there are devices which can be used to eliminate undesirable emotions and to develop and expand the desirable ones.

We have seen in Chapter 2 the generalized picture of the human infant in whom certain neural connections and integrations are functionally present at birth. We know that through a process of maturation other patterns develop and become functional in the absence of any specific training or education. But learning plays a vast rôle in the development of emotional complexity in man. So great is the importance of the training aspect of

emotional development that some persons, even some authorities, have lost sight of the maturational factor. Actually maturation and learning coöperate to steer the emotional growth of the child. You will remember from Watson's experiment, given in the preceding chapter, that the baby at birth and soon after exhibits very few emotions. There are not many stimulating conditions which are adequate to set off recognizable emotional responses. Also we saw that the emotional behavior once aroused was very simple as compared with the highly complex emotional life of the normal adult. In this chapter we shall trace some of the influences which may produce hampering emotions, as well as some of those which may bring our emotional lives into wholesome adulthood.

### *How our emotional behavior becomes complicated*

Granting that there are but from three to six fundamental emotional responses in infancy, how can man become the emotionally complex person that he is? What is the origin of his morbid fears, his daily annoyances, his fine sentiments of patriotism and filial piety? Do these all come as the result of a learning process? Watson would say "yes." Later you will see that such an answer is a little extreme. You will find that maturation plays its rôle in the development of adult emotional complexity. However, an understanding of the rôle of conditioning is so important in helping us to steer emotional development that it will be given very careful attention. There is nothing man can do to speed up the maturational process in the normal human organism, little he would do to slow it down. But conditioning results from contact with environmental situations and can be controlled by parent, teacher, or by one's friends.

*A typical experiment in emotional conditioning.* Watson reports a case of a boy, Albert, a remarkably happy child who, prior to any experiments, was rarely seen to cry.<sup>1</sup> His reaction to a loud sound was the typical fear pattern described earlier (p. 101) as being characteristic of that of most children. Repeated tests were conducted to see that nothing but loud sounds and loss of bodily support would evoke this fear response in the child.

A. How a conditioned fear develops. In the first experiment with Albert an attempt was made to see whether he could be

taught to fear a white rat. The technique used was that of conditioning, which consists, as we have already seen, of presenting together or in close succession two stimuli: one already adequate to bring out a given response, and the other a stimulus which has not, prior to the experiment, ever elicited that response. These two stimuli are called, respectively, the "adequate" stimulus and the "neutral" stimulus. In Albert's case the adequate stimulus chosen was the loud sound; the neutral, or "conditioned" stimulus, was a white rat. The results of this experiment were unmistakably clear. For the sake of accuracy the actual laboratory notes as taken on the spot by the experimenter will be used to tell the story.

Age 11 months, 3 days.

(1) White rat which he played with for weeks was suddenly taken from the basket (the usual routine) and presented to Albert. He began to reach for rat with left hand. Just as his hand touched the animal, the bar was struck immediately behind his head. The infant jumped violently and fell forward, burying his face in the mattress. He did not cry, however.

(2) Just as his right hand touched the rat, the bar was again struck. Again the infant jumped violently, fell forward, and began to whimper.

Because of the disturbed condition of the subject no tests were made for a week.

Age 11 months, 10 days.

(1) Rat presented suddenly without sound. There was steady fixation but no tendency at first to reach for it. The rat was then placed nearer, whereupon tentative reaching movements began with the right hand. When the rat nosed the infant's left hand, the hand was immediately withdrawn. He started to reach for the head of the animal with the forefinger of his left hand but withdrew it suddenly before contact. It is thus seen that the two joint stimulations given last week were not without effect. He was tested with his blocks immediately afterward to see if they shared in the process of conditioning. He began immediately to pick them up, dropping them and pounding them, etc. In the remainder of the tests the blocks were given frequently to quiet him and to test his general emotional state. They were always removed from sight when the process of conditioning was under way.

(2) Combined stimulation with rat and sound. Started, then fell over immediately to right side. No crying.

(3) Combined stimulation. Fell to right side and rested on hands with head turned from rat. No crying.

(4) Combined stimulation. Same reaction.

(5) Rat suddenly presented alone. Puckered face, whimpered, and withdrew body sharply to left.

(6) Combined stimulation. Fell over immediately to right side and began to whimper.

(7) Combined stimulation. Started violently and cried, but did not fall over.

(8) Rat alone. The instant the rat was shown the baby began to cry. Almost instantly he turned sharply to the left, fell over, raised himself on all fours, and began to crawl away so rapidly that he was caught with difficulty before he reached the edge of the mattress.

The evidence for the attachment of a fear response to a stimulus which was previously neutral is unmistakable. The fact that you may not be able to trace in your memory the conditioning events which make you fear some object or person does not detract from the strength of this finding. Emotional responses, once they are set up, frequently outlast conscious memory of the happening that was originally responsible.

B. How a conditioned fear spreads. Watson conducted further experiments to find out whether or not a conditioned fear would transfer to stimulus objects similar to the one to which it had been conditioned. Before the conditioning had taken place, Albert had been playing with fur muffs, false faces, rabbits, pigeons, and other similar objects. He had never shown the slightest fear of any of these. During the five-day period following the conditioning he was not allowed to see any such objects. On the sixth day he was tested again.

Age 11 months, 15 days.

(1) Tested first with blocks. He reached readily for them, playing with them as usual. This shows that there has been no general transfer to the room, table, blocks, etc.

(2) Rat alone. Whimpered immediately, withdrew right hand, and turned head and trunk away.

(3) Blocks again offered. Played readily with them, smiling and gurgling.

(4) Rat alone. Leaned over to the left side as far away from the rat as possible, then fell over, getting up on all fours and scurrying away as rapidly as possible.



(5) Blocks again offered. Reached immediately for them, smiling and laughing as before.

These observations leave no doubt that the conditioned response was carried over the five-day period. The infant was next shown in order, a rabbit, a dog, a sealskin coat, cotton-wool, human hair, and a false face.

(6) Rabbit alone. A rabbit was suddenly placed on the mattress in front of him. The reaction was pronounced. Negative responses began at once. He leaned as far away from the animal as possible, whimpered, then burst into tears. When the rabbit was placed in contact with him he buried his face in the mattress, then got up on all fours and crawled away crying as he went. This was a most convincing test.

(7) The blocks were next given to him, after an interval. He played with them as before. It was observed by four people that he played far more energetically with them than ever before. The blocks were raised high over his head and slammed down with a great deal of force.

(8) Dog alone. The dog did not produce as violent reaction as the rabbit. The moment fixation of the eyes occurred, the child shrank back, and as the animal came nearer he attempted to get on all fours but did not cry at first. As soon as the dog passed out of his range of vision he became quiet. The dog was then made to approach the infant's head (he was lying down at the moment). Albert straightened up immediately, fell over to the opposite side, and turned his head away. He then began to cry.

(9) Blocks were again presented. He began immediately to play with them.

(10) Fur coat (seal). Withdrew immediately to the left side and began to fret. Coat put close to him on the left side, he turned immediately, began to cry, and tried to crawl away on all fours.

(11) Cotton-wool. The wool was presented in a paper package. At the ends the cotton was not covered by the paper. It was placed first on his feet. He kicked it away but did not touch it with his hands. When his hand was laid on the wool he immediately withdrew it but did not show the shock that the animals or fur coat produced in him. He then began to play with the paper, avoiding contact with the wool itself. Before the hour was up, however, he lost some of his negativism to the wool.

(12) Just in play W., who had made the experiments, put his head down to see if Albert would play with his hair. Albert was completely negative. The other two observers did the same thing. He began immediately to play with their hair. A Santa Claus mask was then brought and presented to Albert. He was again pronouncedly negative, although on all previous occasions he had played with it.

Thus we see that a conditioned fear response spreads to other objects resembling the first conditioned stimulus. This spread or irradiation of the emotional behavior gives us further possibilities for the complication of human emotional response. Notice that the amount of spread is in general proportional to the amount of similarity between the various objects.

The experiment just described should give you some insight into why you may immediately dislike some person upon a first meeting with him. A negative emotional reaction attached to one person through some unpleasant contact can transfer to someone else bearing a resemblance, even though you are yourself unaware of the resemblance between them and do not even think of the original individual at all.

*Conditioning the galvanic response.* One of the changes which take place in emotion is the *galvanic response*. This is comprised of two electrical phenomena: (1) the tissues actually generate an electromotive force (voltage); (2) the electrical resistance of the skin is changed.

In some experiments on infants H. E. Jones studied the conditioning and retention of the conditioning of this galvanic response.<sup>2</sup> With a galvanometer he measured the changes in the skin resistance of the subject. The unconditioned or biologically adequate stimulus was an electric shock. Electric shock causes pain and fear. The secondary (originally neutral) stimulus was a low sound produced by the vibrator of an induction coil.

On the first day of the experiment, a conditioned galvanic response to the sound alone was established by presenting the electric shock and the sound together six times. In the course of thirty-five presentations of the two stimuli the response to the sound alone became as strong as the galvanic response originally produced by the electric shock. On each of the following four days marked galvanic responses were obtained when the sound (secondary) stimulus was presented alone at first. Each day, however, after a few presentations of the secondary stimulus alone, the galvanic response would disappear. That is to say, further repetitions of the sound stimulus in the absence of the electric shock would not call forth the conditioned response. This phenomenon is known to psychologists as "experimental extinction."

On each occasion, however, it was found that on the succeeding day the secondary stimulus presented alone was again capable of bringing about the galvanic response, a phenomenon called "spontaneous recovery."

Possibly the most interesting thing about Jones's experiment is the evidence it gives us that painful experiences leave an effect on the organism which is not always observable in the customary outward behavior. A whole month after the end of the original conditioning experiment tests were made to find out whether or not the vibrator would elicit a response. There was by this time no evidence of muscular response to the sound of the vibrator. The galvanic response, however, occurred almost as strongly in response to the sound alone as on the first day. Evidently the mechanism responsible for the galvanic response had retained the conditioning, although the outer muscles of the body had lost it.

This experiment serves nicely as an introduction to our next topic. It bridges the gap between the problem of how emotional responses are conditioned to previously neutral stimulus situations and that of how to get rid of unfortunate conditioned emotional responses once they have been set up in the individual.

### *How we lose our emotional acquisitions*

To have a thorough knowledge of how emotional responses are set up through conditioning in childhood is extremely valuable to the human being living in society in making possible the prevention of many unfortunate emotional acquisitions. Mere prevention is not enough, however. To rely upon prevention of unfortunate associations between innocent secondary stimuli and those which are biologically adequate would demand such a close supervision of the child's environment as to be impracticable and undesirable. Obviously, cure must be added to prevention if we are to rear our children properly and with good expectations of a happy and useful life in society. Watson and his students recognized the importance of the problem of cure and devoted considerable energy to exploring the possibilities and limitations of numerous methods of re-directing the emotional life of the individual who has picked up some handicapping emotional responses.

Discussion of this problem will be limited to fear responses because they are better understood.

Any fear response to an object not biologically adequate is a conditioned response, one that has been learned and hence may be expected to be open to further modification. The first step is to determine, if possible, whether a given fear response, say, fear of a cat, has been established through direct association or by transfer from some similar object. If the latter, it is important to discover what the original conditioned stimulus object was and devote your efforts to eliminating this fundamental response.

Perhaps, for example, the child was originally conditioned to fear a dog by having been barked at suddenly. In this case, the sight of the dog would have become the conditioned or secondary stimulus to a fear reaction, the native fear-producing stimulus having been provided by the loud noise of the dog's barking. This emotional conditioning would then have transferred to other objects of a similar nature, such as cats, lambs, and Easter bunnies. The response to the dog, however, will remain strongest and most deeply set; accordingly much time is saved if it is dealt with first. Elimination of the original conditioned response will go a long way toward doing away with the derived responses.

Several methods have been tried in an effort to eradicate conditioned responses; some have proved to be more valuable and effective than others.

The method of disuse. In the method of disuse the child is carefully kept away from the conditioned fear object in the hope that the unfortunate reaction will be forgotten through sheer disuse. On the basis of Jones's experiment with the conditioned galvanic response you can already predict that the method of disuse would be ineffective in removing a conditioned emotional response. The following laboratory notes taken by M. C. Jones, a student of Watson, give the results of several other typical cases.<sup>3</sup>

CASE 1. . . . Rose D. Age 21 months.

General situation: sitting in play-pen with other children, none of whom showed specific fears. A rabbit was introduced from behind a screen.

JAN. 19. At sight of the rabbit, Rose burst into tears, her crying lessened when E. (the experimenter) picked up the rabbit, but again increased when the rabbit was put back on the floor. At the removal of the rabbit she quieted down, accepted a cracker, and presently returned to her blocks.

Feb. 5. After 2 weeks the situation was repeated. She cried and trembled upon seeing the rabbit. E. sat on the floor between Rose and the rabbit; she continued to cry for several minutes. E. tried to divert her attention with the peg-board; she finally stopped crying, but continued to watch the rabbit and would not attempt to play.

CASE 8. . . . Bobby G. Age 30 months.

DEC. 6. Bobby showed a slight fear response when a rat was presented in a box. He looked at it from a distance of several feet, drew back and cried. A 3-day period of training followed bringing Bobby to the point where he tolerated a rat in the open pen in which he was playing, and even touched it without overt fear indications. No further stimulation with the rat occurred until

JAN. 30. After nearly two months of no experience with the specific stimulus, Bobby was again brought into the laboratory. While he was playing in the pen, E. appeared with a rat held in her hand. Bobby jumped up, ran outside the pen, and cried. The rat having been returned to its box, Bobby ran to E., held her hand, and showed marked disturbance.

CASE 33. . . . Eleanor J. Age 21 months.

JAN. 17. While playing in the pen, a frog was introduced from behind her. She watched, came nearer, and finally touched it. The frog jumped. She withdrew and when later presented with the frog, shook her head and pushed the experimenter's hand away violently.

MARCH 26. After two months of no further experience with animals, Eleanor was taken to the laboratory and offered the frog. When the frog hopped she drew back, ran from the pen and cried.

In the following case a conditioned emotion lasted for a period of three years.

An attractive girl, aged 17, came to the attention of a certain clinic as a voluntary case. For several years her parents had been concerned over the abnormal shyness which she exhibited in the presence of young men or boys. In the presence of members of the opposite sex she would blush violently and lapse into a nervous silence after a few stammered remarks. Her behavior was arrogant when she was with girls of her own age, and at least confident in the presence of adult women. Since she was the daughter of a socially prominent family, the problem presented by this extreme shyness with boys became more and more serious as the year of her formal presentation to society approached. It was this consideration which finally led the parents to consult with the psychologist.

The medical findings were negative. There was no organic disease

apparent. In fact, the girl's physical health was decidedly above average. The social investigation revealed nothing in the home environment at the moment which would seem to be responsible for her mental condition. But social investigation did yield the significant fact that her shyness had developed quite suddenly three years before. The parents had no explanation to offer as to the possible cause of the condition.

The psychologist talked with the girl in a friendly and informal manner. In the course of the conversation it was observed that, while she discussed sports and school activities quite freely, she would invariably become emotional when the subject of boys was mentioned. After several talks the girl had become quite friendly with the woman psychologist and was by then looking upon her as a competent and sympathetic adviser. Little by little the following story came out. Three years before at a children's party the girl had been playing with some boys. In some manner she caught her fingers in a door when it was slammed shut. This caused the child such extreme pain that she became ill and vomited. The incident was quickly forgotten by everybody but the little girl herself, to whom it remained as a crushing misfortune. Although she tried not to think of it, the bitter memory was always there to be reinstated by the presence of boys.

Tests of the sort Watson and Jones have conducted with various children and numerous case histories lead to the conclusion that the method of disuse is not as adequate as many people have supposed. Do not wait for a child to "outgrow" an undesirable emotional response. The results are certain to be disappointing.

*The method of frequent application of the stimulus.* We have seen that guarding the child from the stimulus is not an effective way of removing fear responses. What would be the effect of frequent application of the stimulus? Would it be possible to bring about elimination of a fear response by this method?

This method worked with some children to the extent of eliminating negative responses at least temporarily. In no case did frequent showing of the animal bring about positive responses. In some cases the frequent application of the stimulus seemed to make the children more afraid. The indications are that this method if used carefully will eventually yield the desired results. You can probably recall some fear, dislike, or annoyance which has been lost in this way. Perhaps its main disadvantage as a technique for training children is its slowness.

*The use of ridicule.* In the elimination of conditioned fear

responses, can we make use of the common drive to avoid the scorn of our fellows? The following case serves to indicate the inadequacy and even the danger of this method. Again we quote from the laboratory notes of Jones.

CASE 41. . . . Arthur G. Age 4 years.

Arthur was shown the frogs in an aquarium, no other children being present. He cried, said "They bite," and ran out of the play-pen. Later, however, he was brought into the room with four other boys; he swaggered up to the aquarium, pressing ahead of the others who were with him. When one of his companions picked up a frog and turned to him with it, he screamed and fled; at this he was chased and made fun of, but with naturally no lessening of the fear. . . .<sup>4</sup>

The danger inherent in the use of the method of social ridicule is that if the fear reaction is strong enough, it is possible that it will become attached to other children. That is, the conditioning will go in the wrong direction. The conditioned response may spread to the other objects—or people—present instead of being lessened by their presence. In this way the desire to earn approval of others may even be lost and a dislike of people substituted. The result would be the production of an asocial or antisocial individual.

The possibility of ill effects from this method of treatment is even greater in the adult. The adult is more socialized than the child, more sensitive to social approval and to scorn. Add to these two facts the further one that a conditioned fear of sufficiently long standing to last into adulthood must have been well set up originally, and you can see the possibilities of disaster in attempting to shame adults out of their fears. Shame and fear are not an attractive team, but they pull together rather than apart.

The use of social imitation. What are the effects of social imitation on conditioned fear responses? The following cases, also from Jones, illustrate two possible outcomes of this method.

CASE 8. . . . Bobby G. Age 30 months.

Bobby was playing in the pen with Mary and Laurel. The rabbit was introduced in a basket. Bobby cried, "No, no," and motioned for the experimenter to remove it. The two girls, however, ran up readily enough, looked in at the rabbit, and talked excitedly. Bobby became promptly



interested, said "What? Me see," and ran forward, his curiosity and assertiveness in the social situation overmastering other impulses.

CASE 54. . . . Vincent W. Age 21 months.

JAN. 19. Vincent showed no fear of the rabbit, even when it was pushed against his hands or face. His only response was to laugh and reach for the rabbit's fur. On the same day he was taken into the pen with Rosy, who cried at the sight of the rabbit. Vincent immediately developed a fear response; in the ordinary playroom situation he would pay no attention to her crying, but in connection with the rabbit, her distress had a marked suggestion value. The fear transferred in this way persisted for over two weeks.

FEB. 6. Eli and Herbert were in the play-pen with the rabbit. When Vincent was brought in, he remained cautiously standing at some distance. Eli led Vincent over to the rabbit, and induced him to touch the animal. Vincent laughed.

The method of social imitation, like that of social pressure, must be used carefully if unfortunate consequences are to be avoided. It is safer than scorn, but it is not foolproof.

*The method of verbal appeal.* Many mothers and teachers depend on talking children out of their fears. Such verbal appeal quite naturally is of little value in dealing with babies too young to have much of a stock of words. How does it work with older children? The case of Jean E., a girl of five years, studied by Jones, will help to answer our question.

Jean exhibited great fear of the rabbit when it was shown to her at the beginning of the experiment. Since previous experiments had shown that many children do not fear the rabbit, we are safe in concluding that Jean's fear of the rabbit was of the home-grown variety. For a period of several days she did not see the rabbit again, but she was talked with for ten minutes a day about rabbits. The talk was varied and interesting. It involved looking at pictures in the book *Peter Rabbit*. Brief stories about bunnies were told. She was shown clay models of rabbits. During these chats she pretended great interest in rabbits. Once she said, "I touched your rabbit and stroked it and never cried"—which was not true. At the end of one week of this sort of treatment the rabbit was shown again. Her reaction was practically the same as the first encounter. She jumped up and ran away. When coaxed, she touched the fur of the animal while the experimenter held it safely in his hands, but when the rabbit was placed on the floor, the little girl sobbed, "Put it away—take it."

Verbal organization when unrelated to actual manual and visceral readjustment has little value as a remover of fear response.

*The method of re-conditioning.* The methods so far described have been found to be either totally without effect or very slow. Worse still, some of them are fraught with the possibilities of dangerous consequences. Is it possible and safe to *re-condition* undesirable responses? Let us examine a case reported by M. C. Jones.<sup>5</sup>

Peter was an active child of three years with numerous acquired fears of white rats, fur coats, feathers, cotton-wool, frogs, fish, and mechanical toys.

He was put in the crib in the playroom and was soon observed to be busily playing with his toys. A white rat was put into the pen from behind the child. At sight of the rat the boy commenced to scream and fell flat on his back in a paroxysm of fear. The stimulus object was removed, and Barbara, a girl of two years, was brought into the play-pen and the rat shown as before. She exhibited no fear. She picked up the rat, while Peter sat outside the crib in his chair quietly watching her. A string of beads belonging to Peter was lying on the floor of the crib. Whenever the rat touched the string of beads, Peter would say, "My beads" in a complaining tone. Peter made no objections when Barbara played with the beads. Twenty-five minutes passed before Peter would respond to the often repeated invitation to get down from his chair. He did not approach the rat.

The next day Peter was taken into the laboratory where the following reactions were noted:

| <i>Stimulus situations</i>      | <i>Reactions</i>                  |
|---------------------------------|-----------------------------------|
| Playroom and crib               | Selected toys, got into crib.     |
| White ball rolled in            | Picked it up and held it.         |
| Fur rug hung over crib          | Cried until it was removed.       |
| Fur coat hung over crib         | Cried until it was removed.       |
| Cotton                          | Whimpered, withdrew, cried.       |
| Hat with feathers               | Cried.                            |
| Blue woolly sweater             | Looked, turned away, no fear.     |
| White toy rabbit of rough cloth | No negative or positive reaction. |
| Wooden doll                     | No negative or positive reaction. |

Attempts to eliminate Peter's unnatural fears by use of the method of social pressure had already been made with some evidence of improvement. But before that series of experiments was completed, he fell ill and was placed in a hospital for two months. When he was being brought back from the hospital, a large barking dog attacked him and the nurse just as they entered the taxicab. Both Peter and the nurse were terribly frightened. Peter lay back in the taxicab, weak and exhausted from the encounter. After a few days allowed for recovery, Peter was

taken to the laboratory and tested. His fear responses had returned with more than their former vigor.

Here was an extreme case, demanding some sort of effective action. Jones determined to try a new method, that of re-direction or re-conditioning. This method consisted in associating the presence of a furry object with the pleasurable activity of eating. The procedure was simple and direct but required great caution.

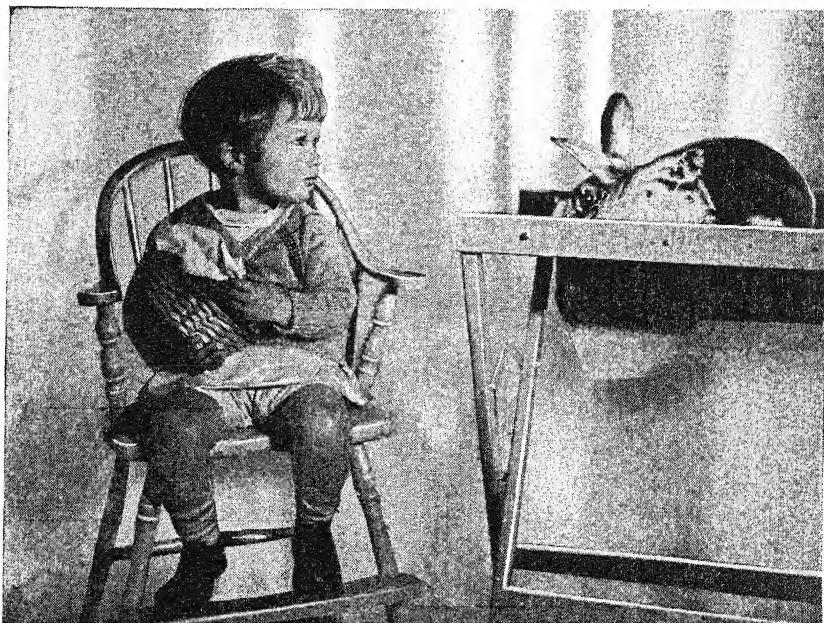


FIGURE 21. *This child, displaying perhaps a slight abnormal fear with a quite normal curiosity, would be an easy subject for re-conditioning toward furry objects.*

At lunch time the child was seated at a low table in a room about forty feet long. Just as he began to eat his lunch, the rabbit was displayed in a wire cage at a distance just far enough away not to disturb his eating. This was a very important point, for were the strong conditioned stimulus allowed to work too actively, it is quite to be expected that the positive reactions to the food would change. That is, the food might in turn become a conditioned stimulus to the fear response. To prevent accidents in this admittedly ticklish matter, the rabbit was kept in his cage during the early phases of the work. Each day the position of the cage was marked. The next day the cage and rabbit were brought somewhat closer. Eventually the rabbit could be placed on the table and even in Peter's lap. In the final

stage of the experiment he ate with one hand as he stroked the rabbit with the other. We may assume from this that Peter's inner emotional response had been re-conditioned even as his outward behavior toward the rabbit had been re-directed, for in children of his age the two aspects of the emotional response are not often dissociated.

Once the fear reaction to the rabbit was completely eliminated, observations were made to determine to what degree this elimination of fear had been transferred to other similar furry objects. Fear responses to cotton, the fur coat, and feathers were completely gone. The responses to white rats were greatly improved. The rats were tolerated in silence, although there was no enthusiastic manipulation of them. Peter now picked up and carried around the room tin boxes containing rats and frogs. A new test was now tried. The boy was handed a mouse, which he had never seen before, together with a tangled mass of earthworms. His responses were at first slightly negative to the whole situation, but after awhile they became positive to the earthworms and neutral to the mouse.

The efforts of the experimenter to eliminate the fear responses to furry objects had been somewhat hampered by her lack of knowledge as to the order in which these fears were built up. The importance of this factor has been discussed on page 143. If the original fears are built up by a dog, then the re-conditioning should involve a dog and not some other furry object to which the fear may spread. However, repeated success in re-conditioning indicates its efficacy in eliminating any conditioned fear in a child. If you do not know which object was first conditioned to the response, you simply have to start eliminating fears and testing until all fears of the general sort of object have been eliminated. To know where to start is a time saver, not an essential.

Conditioned emotions acquired in childhood are increasingly less easy to eliminate as the individual approaches adulthood. It is, therefore, doubly important to control his emotional development as a child.

### *Qualifications of Watson's theory*

In the foregoing discussion we have given an essentially historical presentation. Much emphasis has been placed on the work of Watson and his students, for that group was responsible for the great impetus given to studies in this field during the past fifteen or twenty years. Scientific accuracy demands that certain qualifica-

tions and elaborations of his findings be presented at this time.

Watson and his followers were so keenly aware of the great possibilities for training children to be emotionally healthy that they neglected somewhat the important factor of maturation in accounting for the growth of emotional complexity. Gradually, too, other experimenters discovered that the problem of conditioning of emotional responses is not quite so simple as the results of the Watson group seemed to indicate. Thus we see that the criticisms of Watson's work come down to these two: (1) there is more than conditioning in the growth of emotional complexity; and (2) conditioning is not the simple process of connecting a previously completely neutral stimulus to an emotional response through the simultaneous presentation of it and the adequate stimulus.

*Maturation.* Let us look first at the evidence indicating the importance of maturation in emotional growth.

A. Fear of strange surroundings. In a study conducted at the University of California Child Welfare Station, Bayley observed and recorded the crying behavior of sixty-one infants.<sup>6</sup> They were put through a series of standard or test situations every month during the first year of life. She paid especial attention to crying in fear brought about by being in strange situations. This type of fear behavior occurred when the child was brought into strange rooms, or when he was taken from the mother by a stranger. Besides crying, the response usually involved turning to the mother. This crying behavior disappeared when the child became accustomed to the strange person or room. Apparently, strangeness is a native stimulus to fear which was overlooked or underemphasized by the Watson group.

Table 6 (p. 152) shows the amount of crying due to fear of strange surroundings as a percentage of crying due to all causes. From this table it is clear that crying from fear of strange surroundings is absent during the first two months but becomes relatively more frequent with increasing age. Now why should this relationship exist? One explanation would seem to be that the babies became conditioned to fear new situations. This is possible but not probable. Care was taken not to harm them or in any way to permit the building up of conditioned fear responses to

TABLE 6: *Amount of Crying in 61 Infants Due to Fear of Strange Surroundings (Shown as a Percentage of All Crying)*

| AGE<br>IN<br>MONTHS | PERCENTAGE OF ALL<br>CRYING DUE TO FEAR<br>OF STRANGE SURROUNDINGS |
|---------------------|--------------------------------------------------------------------|
| 1                   | 0                                                                  |
| 2                   | 0                                                                  |
| 3                   | 2                                                                  |
| 4                   | 5                                                                  |
| 5                   | 11                                                                 |
| 6                   | 10                                                                 |
| 7                   | 15                                                                 |
| 8                   | 17                                                                 |
| 9                   | 22                                                                 |
| 10                  | 26                                                                 |
| 11                  | 25                                                                 |
| 12                  | 21                                                                 |

strange persons and situations. A more probable explanation, the one urged by Bayley, is that with the increase in age came an increase in intelligence, and, by consequence, a clearer perception of surrounding things and persons as familiar or strange. By and large these results seem to demonstrate the rôle of maturation in the growth of emotional behavior.

In a study aimed primarily at the investigation of smiling behavior Washburn observed fifteen babies at monthly intervals throughout the first year of life.<sup>7</sup> She reports incidental observations upon the crying and avoidance responses of her subjects which are in close agreement with those of Bayley.

B. Reactions to confinement. Gesell has given us additional evidence for the maturation of emotional behavior.<sup>8</sup> A number of infants of different ages were placed in an enclosed space two by three by four feet in size. The results of his observations are summed up as follows:

At ten weeks he (the child) may accept the situation with complete complaisance; at twenty weeks he may betray a mild intolerance, a dissatisfaction, persistent head-turning, and social seeking, which we may safely characterize as mild apprehension; at thirty weeks his intolerance to the same situation may be so vigorously expressed by crying that we may describe the reaction as fear or fright.

The fact that this fear behavior appeared more strongly in the older than in the younger children when confronted with the confining chamber for the first time gives indication of the operation of the maturation factor.

c. Children's fear of snakes. You have already encountered the question whether children fear snakes. How would Watson answer it? H. E. and M. C. Jones studied the emotional behavior of children and adults suddenly confronted with a large and active snake.<sup>9</sup> One of their experimental situations was the following:

A pen eight by ten feet, by six inches high, was built on the nursery floor. Within this a number of blocks and toys were scattered, and two black suitcases were placed flat on the floor near the wall. The suitcases could be opened easily by a child; one contained a familiar mechanical toy, the other a snake of a harmless variety (*Spilotes corais*) about six feet in length and slightly under four inches in girth at the middle of the body. When free in the pen, the snake glided actively about, showing a powerful, agile type of movement, and frequently protruding a black forked tongue about an inch in length. If the child did not open the suitcase containing the snake, an observer was able to do so from a concealed position, behind a screen, by pulling a string attached to the lid of the case.

As a result of observations made in this and similar situations on children and adults, the experimenters came to the following conclusions:

(X) In our group of 51 children and about 90 adults, children up to the age of two years showed no fear of a snake; by three or three and a half, caution reactions were common; children of this age paid closer attention to the snake's movements, and were somewhat tentative in approaching and touching it. Definite fear behavior occurred more often after the age of four years, and was more pronounced in adults than in children. No sex differences were observed.

(X) The authors point out that this change in fear behavior with age has three possible explanations: (1) it is the result of conditioning; (2) it is the result of maturation of an innate fear of snakes; and (3) it is the result of a general maturation of intelligence which leads to greater sensitiveness and discrimination.

They feel that the first explanation is not to be considered, as the children were carefully reared in isolation from any contact with snakes. These children had never seen snakes or pictures of



snakes, nor had they been told stories about snakes. It is hard to select the correct one of the second two hypotheses. The most probable hypothesis is that as the children mature they become more reactive to any large, moving stimulus. The introduction of the snake represented a large and sudden change in the environment of the children. The authors conclude their discussion with the following interpretation:

. . . Fear arises when we know enough to recognize the potential danger in a situation but have not advanced to the point of a complete comprehension and control of the changing situation.

We are completely in the dark about the nature of the fear response as shown by the adults in this experiment. The typical adult has had so many opportunities to become conditioned against snakes through actual contact or through stories and conversation about them that we cannot confidently unravel that influence from either that of maturation or that of increased intelligence and power to discriminate.

Let us think back over the results reported by Bayley, Washburn, Gesell, and the Joneses. In every instance we saw changes in the emotional behavior of infants which took place in the absence of any great opportunity to learn. The conclusion is that maturation joins forces with conditioning to bring about emotional complexity.

We are now ready to approach the problem of maturation from another angle. We have seen that changes in emotional behavior take place in the absence of conditioning. Next we will examine certain evidence from experiments in which attempts to condition emotional responses failed. These results will tell us more about the rôle of maturation in emotional growth.

Some failures to obtain conditioning of emotional responses. The pioneer work of Watson and his followers left the general impression that growth in emotional complexity is a rather simple thing to be explained entirely as the conditioning of a few native emotional responses. As you have seen, however, Watson's conception had to be altered to make way for the fact of maturation in emotional development. Still further qualifications must be made. There have been some notable failures to obtain condition-

ing of emotional responses. These failures must be taken into account in any attempt to assemble the whole story of emotional growth.

**A.** Valentine's experiment. Valentine attempted to condition a child to fear a pair of opera glasses and a caterpillar.<sup>10</sup> In both instances the native or unconditioned stimulus was the sound of a loud whistle. The interesting fact of his experiment was that although the loud whistle invariably brought about a fear response, Valentine failed to condition that fear response to the opera glasses, although he succeeded easily with the caterpillar.

This failure to establish conditioning raises such a fundamental issue that we must pause to examine still more convincing evidence.

**B.** Bregman's experiments. Bregman presented the sound of an electric bell with a wide variety of objects which possessed no biological significance.<sup>11</sup> The sound of the bell produced a fear or startle response in the infants, but it was impossible to condition this response to the biologically neutral stimuli, such as a cloth curtain, wooden blocks, and rings, even when a large number of trials were given.

The results of Valentine and Bregman make it quite clear that Watson has over-simplified the problem in conceiving of the human individual as born with only three emotional responses which become complicated through conditioning to other objects at first completely neutral emotionally. You will remember that Watson and his followers used animals as conditioned stimuli, not objects, such as opera glasses and bits of paper. The success of the Watson group in conditioning babies to animals, taken along with the failures of Bregman to condition babies to neutral objects, argues against any theory of all-or-nothing native organization of emotional patterns. Valentine's failure with the opera glasses and his success with the caterpillar bring the two sets of results together very neatly. Apparently there is a hierarchy in emotional stimuli. At one end we have such things as loud sounds and loss of body support which will bring about a fear response the first time it is presented. Then we have such objects as rats, rabbits, snakes, dogs, and caterpillars to which children can be conditioned in a few trials. Finally there are neutral objects, such as opera glasses, which

cannot easily be conditioned to the fear response. These findings plus the facts of maturation force us to accept Watson's work with qualifications, but do not destroy its fundamental value in showing an important way to emotional control through learning.

### *Emotion and Language*

THE WORDS with which we think and talk are produced by the coördinated action of the various effector organs going to make up the vocal apparatus. We must not lose sight of the fact that a word—spoken, written, or as we shall see later, *thought*—is a response in exactly the same way that a movement of the arm or leg is. But whereas to us our words are part of our responses, to the other fellow they may be stimuli. The sight or sound of a particular word can be used to evoke emotion just as can any other stimulus.

As the child grows up and learns to use and understand more and more words, these words become welded into his emotional equipment. Some words become disgusting, others fearsome. In this emotional aspect of language we have a part of the explanation of the failure of simplified international languages, such as Esperanto and Ido, to win general approval. Such synthetic languages are lacking in the emotional richness that makes our mother tongue so interesting and enjoyable. Poetry written in, or translated into, Esperanto is pale and lacking in warmth of human feeling. Any effect it may have comes through ideas it arouses, not through the emotional reverberations which accompany the reading of good poetry in a familiar tongue.

#### *Words can become conditioned emotional stimuli*

If every time a child does something of which his mother does not approve, she frowns and says "bad," the word "bad" will come to have the same significance for behavior that the frown has. If the word "bad" is reinforced with a slap or with the removal of some desired toy, its value as a conditioned stimulus will be increased. Through the use of language it is possible to make children fear things that do not even exist. The fear of the "Bogey Man" is a good example of this. No child or adult in his

right mind has ever seen a Bogey Man, yet foolish parents still use this method of frightening children into obedience.

On page 141 we saw how the galvanic response could be conditioned to the sound of a buzzer. By determining the size of this response to various words, we can determine to what extent these words have become emotional stimuli.

Using this method Smith measured the degree of emotion provoked by the hearing of a list of 100 words.<sup>12</sup> There were fifty subjects in the experiment; the figures are the averages for the group. Table 7 (p. 158) shows the amount of emotion provoked by the thirty-eight most effective and the thirty-eight least effective words.

An important limitation of the electrical measurement of emotion results from the fact that pleasant emotions seem to produce changes which are about as strong as those which come in unpleasant emotions; and at the present time nobody has discovered a way of distinguishing the two kinds of emotion by use of the galvanic response.

✓ *Does emotional conditioning exist below the level of consciousness?* Diven has made a study to find out whether words can become conditioned stimuli to emotional responses even when the subject is not conscious of the relationship between the word and the emotion it produces.<sup>13</sup>

The emotional reactions of fifty-two college students were measured by the galvanometer technique. A series of lists of stimulus words built about critical words were pronounced by the experimenter, the subjects giving their associations. In one series of neutral or non-significant words was the critical word *barn* which was always preceded by the word *red*. Just after the word *barn* was pronounced, the subject was given a painful but not dangerous electric shock.

Immediately after the presentation of the list of stimulus words, the subjects were asked to recall as many of them as they could. Critical words (words followed by shock) were recalled by fewer of the subjects than were the non-critical words.

Five minutes after its first presentation, the list of stimulus words was repeated, this time without shock. Neutral words produced no emotional responses as measured by the galvanometer,

TABLE 7: *Amount of Emotion Evoked in 50 Subjects by 76 out of 100 Stimulus Words as Revealed by the Galvanic Response*

| STIMULUS<br>WORD               | GALVA-<br>NOMETER<br>DEFLECTION | STIMULUS<br>WORD     | GALVA-<br>NOMETER<br>DEFLECTION |
|--------------------------------|---------------------------------|----------------------|---------------------------------|
| 1. Kiss . . . . .              | 72.8                            | 63. Go . . . . .     | 22.6                            |
| 2. Love . . . . .              | 59.5                            | 64. Cook . . . . .   | 22.3                            |
| 3. Marry . . . . .             | 58.5                            | 65. Yellow. . . . .  | 22.2                            |
| 4. Divorce. . . . .            | 50.8                            | 66. Chair . . . . .  | 21.7                            |
| 5. Name (of subject) . . . . . | 48.7                            | 67. Finger . . . . . | 21.5                            |
| 6. Woman. . . . .              | 40.3                            | 68. Sad . . . . .    | 21.4                            |
| 7. Wound . . . . .             | 38.0                            | 69. Tree. . . . .    | 21.2                            |
| 8. Dance . . . . .             | 37.4                            | 70. Needle. . . . .  | 21.1                            |
| 9. Afraid . . . . .            | 36.8                            | 71. Blue. . . . .    | 20.6                            |
| 10. Proud . . . . .            | 36.7                            | 72. Ship. . . . .    | 20.5                            |
| 11. Habit . . . . .            | 36.6                            | 73. Motor . . . . .  | 20.4                            |
| 12. Money . . . . .            | 35.6                            | 74. Frog. . . . .    | 20.2                            |
| 13. Fight. . . . .             | 35.0                            | 75. Walk . . . . .   | 20.1                            |
| 14. Child . . . . .            | 35.0                            | 76. Try . . . . .    | 20.0                            |
| 15. State. . . . .             | 34.8                            | 77. Plum . . . . .   | 20.0                            |
| 16. Despise. . . . .           | 34.7                            | 78. Village. . . . . | 19.9                            |
| 17. War . . . . .              | 34.1                            | 79. Rich. . . . .    | 19.9                            |
| 18. Family . . . . .           | 33.6                            | 80. Salt . . . . .   | 19.8                            |
| 19. Happy . . . . .            | 33.4                            | 81. Bird . . . . .   | 19.6                            |
| 20. Pray . . . . .             | 33.1                            | 82. Bread . . . . .  | 19.6                            |
| 21. Worry . . . . .            | 33.0                            | 83. Old . . . . .    | 19.3                            |
| 22. Insult . . . . .           | 32.5                            | 84. Cow. . . . .     | 19.0                            |
| 23. Friend . . . . .           | 32.2                            | 85. Bring . . . . .  | 19.0                            |
| 24. Head. . . . .              | 31.7                            | 86. Clean . . . . .  | 18.8                            |
| 25. Angry . . . . .            | 31.5                            | 87. Ink . . . . .    | 18.7                            |
| 26. Wine. . . . .              | 30.9                            | 88. Sheet . . . . .  | 18.6                            |
| 27. Luck. . . . .              | 30.8                            | 89. Table . . . . .  | 18.5                            |
| 28. Green . . . . .            | 30.4                            | 90. Work . . . . .   | 18.3                            |
| 29. Ask . . . . .              | 30.0                            | 91. Carrot . . . . . | 18.2                            |
| 30. Make. . . . .              | 29.9                            | 92. Bury. . . . .    | 18.0                            |
| 31. Pity . . . . .             | 29.7                            | 93. Hunger . . . . . | 17.9                            |
| 32. Choice . . . . .           | 29.7                            | 94. White . . . . .  | 17.8                            |
| 33. Dress. . . . .             | 28.5                            | 95. Glass . . . . .  | 17.6                            |
| 34. Wicked. . . . .            | 28.4                            | 96. Give. . . . .    | 16.7                            |
| 35. Dead. . . . .              | 27.6                            | 97. Flower. . . . .  | 16.1                            |
| 36. Sing . . . . .             | 27.6                            | 98. Pond . . . . .   | 15.5                            |
| 37. Horse . . . . .            | 27.1                            | 99. Pencil . . . . . | 15.4                            |
| 38. Evil . . . . .             | 27.0                            | 100. Swim . . . . .  | 14.2                            |

whereas the critical words did. Subjects who could not recall the critical words still responded emotionally to them. In fact, those subjects responded even more violently to the critical words than did subjects who could recall them. Emotional conditioning obviously can exist below the level of consciousness.

Emotional responses occurred also in response to the word immediately preceding a critical word, for example to *red*. In fact, words not in the original list but having to do with things rural, such as *farm*, produced emotional responses. This finding was clearest in the case of those subjects who could not recall the critical words.

After the deconditioning series (hearing list of words without shocks) all subjects became less reactive to all critical words, but the subjects who could not recall the critical words did not lose as much emotional reaction as those who could recall them.

The conditioning effects of one presentation of the list persisted as long as two weeks.

These experiments show clearly the possibility of fears of unrecognized origin developing in us and transferring to innocent objects and situations.

Word-association tests. More evidence on the arousal of emotions by words is provided in the results of word-association tests. One kind of word association is *free association* and consists of having a person listen to, or read, a series of stimulus words to each of which he responds as quickly as he can by giving the first word that comes into his mind. Analysis of such responses can reveal much about the emotional life and personality of the subject. Let us consider some of the ways in which our responses in word-association tests express emotion.

A. Variation in reaction time. If the word arouses emotion, especially an unpleasant one, the subject tends to hesitate before responding. Carter measured reaction times for words, using 100 children in the sixth and seventh grades.<sup>14</sup> Pleasant, unpleasant, and indifferent words were present in the lists. Reaction times were significantly longer for unpleasant words than for pleasant or neutral words; there were no significant differences between the times for pleasant and neutral words.

The details of the physiological process of delayed response in

the case of words fraught with emotional connotations are not entirely clear. It would seem that even feeble emotions will temporarily paralyze the higher thought processes, much as gross emotions can momentarily paralyze adaptive postural responses. Sometimes, curiously enough, the reaction time is quickened for unpleasant words, as though the subject wanted to go through with the thing as soon as possible and be spared further pain.

B. Perseveration. In the typical word-association test it is not uncommon, where there has been emotional response with a word, to see that word reappear to stimulus words occurring later in the list. This phenomenon, called perseveration, is poorly understood by psychologists, but it is frequently observed.

C. Failure to respond. In some ways failure to respond is simply an exaggeration of slowed response. Complete blocking of a line of thought carrying emotional freight occurs with especially potent stimulus words. The subject sometimes strives to cover this up by pretending that he did not hear the stimulus word, by coughing, by pretending that he thought the word was something else, by asking a question, etc. Such irrelevant behavior has the same significance as either failure to respond or delayed reaction.

D. Overt behavior. Sometimes the emotionally significant stimulus word will evoke the overt behavior of blushing, lowering the eyes, stuttering.

E. Logical responses. Sometimes the subject is caught off guard. His unedited response shows us something about his emotional life. Suppose that in response to the stimulus word *love* one boy gives "mother," another says "Gertrude," while still another says "country." We should have here strong evidence that these boys differed markedly in their emotional organization.

F. Unusual responses. An unusual response is one which will be given by very few persons of the same cultural background. A significant stimulus word evokes an unspeakable response; so the subject protects himself by saying anything that comes into his head. For example, he might name some object in the room and say to himself, "Aha, I fooled him that time." But he has deceived no one. Such unique response words, selected for their irrelevance or through some arbitrary association process not



common to the group, are just as revealing as the suppressed response would have been.

The word-association test has other uses in addition to the study of emotion at a given moment. It can be used to detect guilt with a fair degree of success. When the word-association test is combined with the galvanic technique, the results in the detection of guilt are even better. The student who is especially interested in the problem of guilt detection by means of word-association tests is urged to read the reference by Crosland, who has carried out a series of excellent experiments in this field.<sup>15</sup>

### *Words can take the place of overt emotional responses*

It is entirely possible for a word to take the place of an act. If the natively present pattern of action is such as to come in violent conflict with the social or material environment and thus lead to painful consequences, it will eventually become suppressed. If some word has previously been associated with the response, the word might continue to be used when the individual finds himself in the same emotional situation long after the original response has ceased to appear. In fact, the conventions of modern society so restrict the expression of the emotions at the level of overt action, that much of our emotional behavior comes to consist in the visceral component with words substituted for outward deeds. You cannot tear out the heart of the man who has stolen your girl, but you can curse him.

## *Emotional Control in the Adult*

SUPPOSE that you were unwisely conditioned as a child and now have many handicapping emotional responses. Must you give up or is some control possible?

### *Keeping your head*

Even though the responses of the viscera or "insides" cannot easily be voluntarily controlled, the outer aspects of emotion, the ones open to view, are subject to voluntary control. Once an undesirable emotion has got started, we can by practice learn to assume a "poker face" and thereby keep other people from knowing about



FIGURE 22. *Civilization still shows primitive exchange of primitive emotion. More acceptable if easier release is found in watching two men pound each other. Most constructive of all battles, of course, are verbal battles in which the primary motive may well be passionate search not for blood but for truth. Even here a well-timed note of sarcasm can lay an opponent low, often does, in the mind of the audience.*

it. In many social situations this is half the battle, for many of our destructive emotions carry with them overt acts which invite the other fellow to show emotion, which, in turn, stimulates us to further emotion. We can stop this vicious circle by concealing our emotion at the start.

There are many indirect means by which a person can learn to control the inner manifestations of emotion. Many of these methods must be pointed out to the individual by a clinical psychologist or by a psychiatrist. If you feel that you are hampered by maladaptive emotional responses, you should consult your in-

structor, who will tell you how to proceed or will recommend a specialist in clinical psychology or psychiatry to help you work out your problem. No two cases of emotional maladjustment are exactly alike, and for that reason no textbook description will exactly fit a particular case in all details. There are some general rules which can be used for what they are worth, but they are not stated here as the universal panacea. Psychology is not that simple. Mental health is not so easily gained.

### *Avoiding emergency situations*

Even more basic than keeping one's head in emotion is avoiding the emotion entirely. Emotions are emergency responses. The emotionally stable person does not permit unimportant situations to develop into emergencies. Provide yourself with a ready, learned response to meet the situation. Execute this response, and the strong emotion may be averted.

As you have seen above, it is persons rather than things that most often produce emotion in us in the course of our daily living. You can use much that you now know about people to avoid emergency and emotion-provoking situations. For example, knowing that most persons anger more easily when hungry, you would not attempt to adjust a difficult point just before meal-time.

Since our emotions provoke similar emotions in others, we must be very careful not to have undesirable emotions or, at least, not to show them when we are dealing with an emotional person. By controlling or concealing our emotion we are helping the other person avoid an emotion-producing situation.

It is not advisable, however, to attempt to avoid the emotion by failing to admit that an emergency situation exists when it cannot be physically avoided. Psychologists working for the British Government have made many interesting observations on the emotional behavior of people huddled together in bomb shelters during air raids. These observers find that admission of fear when in serious danger is a favorable condition to the facing of fear. In wartime both soldier and civilian must learn to carry on in the face of danger and despite fear. The person who boasts of not being afraid when there is real danger is placed under a double load of fear. He has created another emergency situation over and



FIGURE 23. *Old ideals, like old orders, change. English people, in spite of their tradition of strong, silent knights, find that admitting they are afraid in an air raid makes them less afraid.*

above the original danger which was outside his control. He is now not only afraid of the bombs, but also that his bluff will be called—that he will show his fear—after boasting that he is unafraid.

### *Laughing it off*

The person who actively seeks the element of humor in a trying situation is making use of an important procedure in emotional control. The ability to laugh it off has saved many an awkward situation in the classroom or in social life. The world is thankful to the person who can create laughter. There is something about it which sweeps away annoyance, worry, jealousy, and even disgust. Laughter dispels timidity and takes the rough edge off the too aggressive act. Laughing is mutually stimulating. Your laughter will start that of the other person. His laughter in turn will make your own more hearty.

Even the infant laughs. Smiling, a forerunner of laughing, is first observed in children around six weeks of age.<sup>16</sup> It is at first as likely to come in response to an angry face of another person as to a smiling one. Later, satisfaction of hunger and other bodily

needs comes to produce smiling in the baby. These observations suggest again that smiles and laughter in social situations are largely conditioned responses.

Many scholars have attempted to analyze the conditions which make for smiling and laughing behavior. In general, laughter seems to be most closely associated with the emotion of elation which comes with success. There are many elements which enter into the laugh-provoking situation, but in most cases we can find a little of the elation which is a part of the feeling of superiority. Children who do not know better and some adults who should know better laugh at physical deformities or at the misfortunes which befall others. But there seems to be more to laughter than the mere elation which comes with success or that elation which comes with a feeling of superiority. We laugh hardest when the misfortune comes to some person whom we do not like. It is far funnier to see a pompous fool slip on a banana peeling than to see an old man stumble over a curbstone. The cock-sure person who makes an obvious mistake causes us to laugh, whereas a more modest person who falls into a similar error would receive our sympathy.

There is an element of suddenness and unexpectedness in most laugh-provoking situations. When our expectations are suddenly deflected by the arrival of some unexpected but not unpleasant event, we laugh. This effect can be achieved by understatement when the thing referred to is really serious. Note, for example—

Because of dull business, seats on the Stock Exchange are now selling at the lowest price in a generation. Most brokers prefer to do their sleeping in the privacy of the home.      HOWARD BRUBAKER in *The New Yorker*

When suddenly it becomes obvious to us that another person's interpretation of a given set of facts differs markedly from our own, we laugh. An Irishman and an Englishman were arguing concerning the merits of their respective countries. To prove his point that the English have always been leaders in science and invention, the Englishman told of a certain castle in which wires had been found imbedded in the walls. "This proves conclusively," the Englishman argued, "that we Britishers had telephones even during the Middle Ages." The Irishman, not to be outdone, told

of a castle in Ireland which had recently been torn down. "The workmen found no wires in this old Irish castle," replied the Irishman brightly, "proving conclusively that in Ireland during the Middle Ages we had radio."

As has been suggested, a joke is the more enjoyable, everything else the same, when the laugh is on an offensive person. The following dialogue between an irritable, egotistical, and sarcastic instructor and a hard-working, but not-too-bright-student amuses us, because the offensive-mannered instructor is neatly put in his place. Instructor (to student in German class who, despite all efforts to learn the new sound, still pronounces the German word "ich" as though it were spelled "ik"): "Ik! vy do you always say 'ik'? Vy can't you say 'ich'?" Student: "I guess I can't say 'ik' for the same reason that you can't say 'why.' "

Besides the fact that our sympathy is with the student, there is the element of the unexpected here also, but our appreciation of the humor of the situation is magnified by our feeling that the instructor got what he deserved.

Wolff, Smith, and Murray performed an experiment demonstrating the importance of this element of sympathy for the person who comes out on top in determining the degree of humor perceived.<sup>17</sup> The following joke was told to Jewish subjects. With one group a Jewish name was given the individual who was the butt of the joke, and with another group a Scotch name was used:

*Pat*: "Will you help me by cashing this check?"

*Ikey*: "I wouldn't cash a check, even for my own brother."

*Pat*: "Well, you know your family better than I do."

When the name Ikey was replaced by a typical Scotch name, the Jewish subjects thought the joke was funnier. In a similar fashion, women were more amused by jokes at the expense of men than by the same jokes at the expense of women. To be funniest, the joke must be on somebody of whom we do not approve or toward whom we are neutral. It is harder to laugh at a joke which is on us or on a member of our own cultural group.

Laughter, like other emotional outlets, should be controlled. There are times when laughter will set things right, but there are

other times when laughter is entirely out of place. Laughter is an antidote for the small annoyances and disappointments of daily life. We cannot use it to dispel our own grief coming from the death of a loved parent or sweetheart, or to lessen the grief of a similarly afflicted friend. The characteristic thing about humor is that we must be in the mood for it or, at least, not too far from the mood. When one is experiencing deep grief, laughter and joking serve only to increase the pain of the experience. The practice of wearing black when in mourning is a social convention built up partly to protect the grieving one from being expected to laugh when laughter is impossible, and partly to protect others against the humiliation which comes from misplaced levity.

### *Working it off*

Work is a good solvent for moods and emotions. One of the best ways of combatting gloom and depression or of allaying anger and fear is to keep busy. Get some activity in progress and that activity will eventually overwhelm the unwanted emotion. The old ideas of whistling in fear, running around the block in anger, and similar devices are psychologically sound.

Writers, musicians, and painters are often moody fellows. Many of them are frequently able to capitalize on their moods and, at the same time, by giving substance to their apprehensions work off the mood. Consider the following item from "Talk of the Town" in *The New Yorker*:

Every year we go into the months of February and March with the same feeling of gloom and despair. It is the way we felt as a child when the Long Island trains suddenly dipped into their tunnel under the East River on their way to Pennsylvania Station—a chilly plunge into the long darkness, with the blood singing in our ears and sweat on our palms and never much hope of reaching Thirty-fourth Street alive. We can remember long, mysterious halts in the middle of the river when there was only an eggshell of steel and concrete between us and all the water in the Atlantic. We used to invent a thousand catastrophes—a nudge from one of those sharp keels overhead and then the water roaring and boiling against the windows; an explosion of deadly gas (in those days everybody knew that the tunnel was full of fumes only waiting for a spark); a head-on collision, hurling the cars through the walls of the tube as if they were paper. As we've said, it's always been the same way with the melancholy and dangerous journey



through the next two months; we've never really hoped to see the spring. This year the chances for us and the world seem even more negligible than usual. The tunnel is darker than it ever was, the gas much thicker, and the walls are leaking like a sieve. God knows what's ahead on the track.

Some of the greatest literature has been produced in grief. When Keats died, Shelley wrote:

I weep for Adonais—he is dead!  
O, weep for Adonais! though our tears  
Thaw not the frost which binds so dear a head!  
And Thou, sad Hour, selected from all years  
To mourn our loss, rouse thy obscure compeers,  
And teach them thine own sorrow, say: "With me  
Died Adonais; till the future dares  
Forget the past, his fate and fame shall be  
An echo and a light unto eternity!"

Although we cannot all be poets, we can turn to the poets for release of our grief.

Music is an effective means of working off unpleasant and handicapping emotions. Music properly selected can lift an individual from the depths of despair. The music listened to must be compatible with the listener's mood. To ask a person in grief to listen to light music not only would be bad taste but would probably deepen his grief by reminding him that others are light-hearted.



★ Emotional complexity is produced by the combined action of learning and maturation. The emotional responses of the human infant become attached to numerous situations through the process of conditioning. The prevention of hampering emotions is important. However, learned emotional responses once learned can be unlearned. If they are not unlearned, they will persist for a lifetime as a handicap to effective living. Childhood is the most effective period in which to control emotional development. Many methods have been tried in treating conditioned responses. Some have proved more valuable than others. The most effective way of getting rid of an unfortunate emotional response is to substitute a desirable response for it. This is a delicate procedure and should be attempted only by a trained psychologist.

The failures of certain psychologists to condition fear responses to harmless objects suggests that emotional responses are not divided sharply into classes of innate and learned behavior. Stimulus objects differ from each other in the amount of time required to condition an emotional response to them.

Language plays an important part in our emotional life. There is much evidence to show that emotions can be aroused by words, and that words can take the place of actions.

All of the evidence on emotional activity indicates that the way to enjoy your emotional life is to control it. There are many ways of providing ready, learned responses to meet unpleasant situations. The best way to control emotional behavior is, clearly, to acquire useful emotional responses and to lose hampering ones.

### *Recommended Readings*

CHAPPELL, M. N. *In the Name of Common Sense; Worry and its Control*. Macmillan, 1938.

Practical advice is given both the expert and the novice worrier on how to get rid of the worrying habit.

EASTMAN, MAX. *Enjoyment of Laughter*. Simon & Schuster, 1936.

A book which is written to explain why you laugh. If it makes you laugh, you are that much ahead.

JONES, M. C. "The Conditioning of Children's Emotions," Chapter 3, *A Handbook of Child Psychology*, C. A. Murchison, Editor. Clark University Press, 1933.

A review of the literature on the conditioning of the emotions with enough discussion to make it interesting.

PRESCOTT, D. A. *Emotion and the Educative Process*. American Council on Education, 1938.

How the emotions of children help or hinder their education.

WATSON, J. B. "Experimental Studies of the Growth of the Emotions. Recent Experiments on How We Lose and Change Our Emotional Equipment." *Psychologies of 1925*. C. A. Murchison, Editor. Clark University Press, 1928.

WATSON, J. B. *Psychological Care of Infant and Child*. Norton, 1928.

The factual material of the preceding reference presented in semi-popular form.

*"Emotion turning back on itself and not leading to thought or action, is the element of madness."* STERLING

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## CHAPTER 6

# NORMAL AND ABNORMAL REACTIONS TO CONFLICT

*To be or not to be; to do or not to do—these are the questions. All normal human beings have conflicts; no normal human being enjoys being in conflict. What your conflicts can do to you and what you should and should not do about your conflicts.*

CIVILIZED LIVING restricts the expression of our emotions and limits the satisfaction of our drives. Under modern conditions it is necessary that these limiting conditions be imposed. For example, during the primitive stages of our existence it was considered perfectly proper to kill an enemy in anger or fear. To-day these emotions cannot be so freely expressed.

The denial of a drive or emotion is called *frustration*. When one emotion or motive of the individual is frustrated because its expression is inconsistent with that of another emotion or motive, we say that the two tendencies to action are in *conflict*. Conflicts disrupt our mental life and destroy its inner harmony.

Everybody seeks inner harmony, but such harmony is not easy to achieve when one lives in a world of conflicting aims and ideals. To be alive is to be in conflict. Conflicts are unpleasant, but they are not dangerous to mental health if they are properly dealt with. If improperly dealt with, however, mental conflicts can result in what the layman calls a "nervous breakdown." Or they can even, in extreme cases, be the precipitating factors in a major mental disease. Conflict by itself cannot produce insanity in an individual of good heredity, but thousands and thousands of case histories show that a prolonged, unresolved conflict can be the deciding factor—the straw that breaks the camel's back—in precipitating an hereditary mental disorder.

### *The Universality of Conflict*

MOST of our conflicts are small ones which are temporary, easily resolved, and unimportant. Have you ever set forth to run a couple of errands without any thoroughly prepared plan as to which one you would do first? You have a letter which simply must be mailed before the post office closes, and you definitely must get that book out of the library before 10 o'clock. Otherwise you will not be able to prepare an important assignment for the next day. It is now 9 o'clock in the evening. The last mail is picked up at 9:30 at the post office, which is almost a half hour's walk. "If I hurry to the post office to mail the letter," you argue, "I can probably get back to the library in time to get the book before the library closes. But the sooner I get to the library, the better the chances are that I will get a copy to use overnight. If I wait until just before closing time, the chances are that all the available copies on reserve will have been taken. Maybe it would be better to go to the library and make sure of the book. Once I have signed for the book, I can hurry to the post office, mail my letter, and come back to collect the book."

This seems for the moment to be a pretty satisfactory solution; so you start toward the library, when suddenly the thought strikes you that it might require several minutes of standing in line to sign up for the book, a delay which could very easily make you late in getting to the post office and hence cause you to miss the

last outgoing mail. You stop in your tracks, turn and start for the post office, resolved to make sure of getting the letter into the mail and to take your chances on getting a copy of the much-needed book. Hurrying now in the direction of the post office, you are conscious that your plan is not altogether satisfactory. After all, it is an important assignment, and it would be just your luck for the professor to give an unannounced quiz. The more you think about this, the more uncertain you become that you have selected the wise course of action in going to the post office. Once more you stop and are about to head for the library. The absurdity of your behavior strikes you with such force that in exasperation you say aloud, "Make up your mind. Make up your mind!" It doesn't help your state of mind at all when passers-by stop and stare at you. By this time it is commencing to look as though you might as well give up the idea of the letter *and* the book and decide whether or not it will be the letter *or* the book. Fortunately, the solution to this conflict is suggested by the sight of a telegraph messenger riding along on his bicycle. "I've got it," you tell yourself gleefully, and start for the library, much relieved. You get your book reservation in, go to a pay phone and call in your telegraph message. By this time you are so proud of your ability for managing complex situations that you decide to celebrate by having a chocolate malted while waiting for the book to become available.

"This is just one example. Conflicts, like death and taxes, are always with us."

### *Types of Conflict*

ANY AND ALL KINDS of drives can conflict with one another—whether biological or social drives or merely desires induced by what we are experiencing at the moment. Since our drives and desires may be either positive or negative—either seeking or avoidance—three types of conflict are possible. Lewin calls them conflicting attraction, attraction-repulsion conflict, and conflicting avoidance.<sup>1</sup>

The first type, conflicting attraction, is described by Lewin as occurring in an environmental situation and involves two desirable but exclusive goals. For example, a child holding a toy

wants to pet a kitten. He must put down the toy in order to take up the kitten. This is a "have your cake" vs. the "eat your cake" type of conflict. At the adult level we have the well-known example of the young man who wishes to marry and also wishes to complete his education when his financial condition will not permit both. Type I conflicts are usually easily resolved by choosing one alternative or by discovering some solution which permits you to achieve both goals.

In the second type of conflict, attraction-repulsion, an object attracts the individual toward it while another object at the same point in space simultaneously repels. An example of this is the child who wants to pick a water lily but is afraid to wade out in the water to get it. The college boy who wants to be a football hero but is afraid of being hurt is another example. Type II conflicts usually produce indecision and vacillation of behavior. The closer you get to the attractive object, the stronger the repulsion of the other.

The third type of conflict, conflicting avoidance, presents two objects to be avoided but by behavior which is mutually exclusive. For example, you don't want to study; neither do you want to fail in the course. Another example is not wanting to be tired but not wanting to go to bed. Type III conflicts are usually solved by "going out of the field." If you don't want to study and if you don't want to fail in the course, you withdraw from school or drop the particular course. If you don't want to go to bed and at the same time you don't want to be sleepy, you might drink strong coffee to wake you up. In each of these instances you have gone out of the field—removed yourself from the conflict situation.

In the long run, however, it is not what kind of conflict you have that matters, but what you do or do not do about it. In the following section you will see some of the good and bad ways of reacting to a conflict.

### *Varieties of Reaction to Conflict*

THE ADEQUATE RESOLUTION of a conflict occurs when out of the turmoil of attempted solutions, grave doubts, and rejected plans there emerges some adequate pattern of response. The

process of arriving at a solution to a conflict is a combination of trial and error and patient rational analysis. Since your mental well-being depends not on whether you have conflicts but on how you handle the ones that are bound to come, it is extremely important for you to know exactly what you are doing and not to deceive yourself.

Presented with a conflict, you will do one of two things about it. Either you will remove yourself from it physically or mentally, or you will attempt to resolve the conflict in some way, consciously or not.

Sometimes the situation is just too much for you; if it is an impossible situation beyond your powers to solve, your best course of action may be simply to leave the field and put yourself in a situation more in keeping with your abilities. This, however, is essentially a flight reaction. In most cases conflict should be faced and solved; for most conflicts a solution can be found.

Sometimes, of course, the individual is not skilled enough in self-analysis to select his best line of action. And sometimes he is so upset by the conflict that he is unable to solve any sort of problem. In such cases the problem of solving a conflict can be considerably reduced if some experienced person is available to point out the way. In recent years the practices of psychiatry and clinical psychology have arisen to supply such service. A long period of studying the individual is often necessary in order to find out what caused the conflict, followed by a period of tedious re-training. If the person in conflict is cared for in time, however, the outlook is favorable. Delays are dangerous and may be fatal to mental health and happiness.

### *Indirect attempts to resolve conflicts*

The individual can react to conflict in many unfortunate ways. These reactions are called abnormal because they depart from smooth and effective behavior. The various ways of reacting to conflict which are to be discussed may occur in any degree; in mild form they are normal and present in us all but in extreme form are dangerous, possibly ending in insanity. Let us, then, look at some of the satisfactory and unsatisfactory ways of handling conflict.

1. *Sublimation and substitution.* The expression of an emotion



or drive is not limited to one channel but may be directed into other types of activity if no direct satisfaction is available.

To choose but one example, our society surrounds the exercise of the sexual function with a number of restrictions. When approved direct expression of the sexual emotions is not possible, many individuals turn to indirect expression. If such indirect expression takes the form of interest in romantic literature, writing poetry, or even composing sentimental love letters, society approves. This indirect, but socially acceptable, expression of an emotion or drive is called *sublimation*. Sexual emotion is sometimes indirectly expressed by socially unacceptable actions such as telling ribald stories, writing obscene poetry, singing smutty songs, and similar language behavior. This type of behavior is called *substitution*. The person who finds expression for his sexual emotions in art or music or aesthetic dancing is *sublimating*. The person who practices masturbation is *substituting*. Sublimation changes the conscious quality of the emotion, making it more socially acceptable, while substitution often leaves the emotion unchanged and is apt to be accompanied by a feeling of self-disapproval, guilt, and inferiority.

2. *Compensation and overcompensation—their relation to inferiority complex.* Compensation, like sublimation, is socially acceptable. It means earning social approval by doing a thing in which you can succeed to counterbalance failure in some other activity. Overcompensation is more extreme than compensation, less rational, and more apt to be antisocial. In overcompensation the activity developed to counterbalance failure becomes too strong, and there is unbalance in the other direction.

A person who is born with features that are not pleasing when in repose can *compensate* by developing a charming smile and by learning how to converse interestingly with others. Such a person eventually will be sought out as a guest and companion. A desirable trait has been developed to make up for the undesirable one over which the individual has no control. But suppose this same person were to develop differently. Let us imagine that the ugly child was taunted by his schoolmates and was generally "left out of things." In such cases the unfortunate individual acts on the principle of making people hate him. He may use vile language,

create disorder in the classroom, fight, steal, and commit all of the antisocial acts a youngster can think of. A person reacting in this way is *overcompensating*.

Both compensation and overcompensation are closely related to the phenomenon of inferiority complex. Over half of the students in a large class in elementary psychology answered *Yes* to each of the following questions:

Do you get stage fright?

Have you ever been depressed because of low marks in school?

Do you ever cross the street to avoid meeting somebody?

Do you often feel self-conscious in the presence of superiors?

A *Yes* answer to such questions is indicative of a feeling of inferiority. The inferiority complex results from continued frustration or thwarting of important drives. The person with an inferiority reaction compares himself unfavorably with others. Whether the basis for the feeling of inferiority is real or imagined is of little consequence. The results are the same. He often attempts to conceal his felt inferiority by criticism of the people about him or by pretending that the goal of the successful person is not worth attaining. Once the feeling of inferiority has become established in the individual as the result of the frustration of some drive, it tends to spread to all phases of that person's activity and life. The symptoms of an unchecked inferiority complex are not pleasing to the afflicted one's associates, with the result that he is soon left to his own devices, a state of affairs which gives him a great deal of time in which to brood and to search for more sources of inferiority feelings.

There are many subtle manifestations of the inferiority reaction which we can see in ourselves and in the people about us. Ask yourself the following questions. Do you change the topic of conversation when people speak of the success of one of your acquaintances? Do you attempt to build yourself up by implying that the people about you are narrow-minded, "small townish," or uninteresting? Do you condemn with faint or misplaced praise? The author once heard one musician say of another who had just completed a successful piano recital: "Isn't she good looking? I simply *adore* her evening gown." If you are frail of body, do you

make fun of "dumb athletes"? If you are poor in your studies, do you sneer at "grinds" and boast that you never "crack a book"? Do you praise excessively and loudly in others the qualities which you yourself obviously possess? These are some of the subtler manifestations of the inferiority complex. We all show some of the signs of the inferiority reaction from time to time.

However, a person can do many things to stop the small feelings of inferiority from developing into large ones. Prevention of an inferiority complex is naturally better than cure. Success at something is the best means of preventing (as well as the best cure for) the inferiority complex. Many people feel inferior because their ambitions do not square with their abilities. Such a feeling of inferiority is unwarranted, for there are so many things to be done in the world that everyone has an opportunity to apply whatever abilities he possesses. It is the duty of parents, friends, teachers, and ministers to help people set up attainable goals, but the individual can accomplish much along these lines by himself. He can cultivate special skills as asset qualities by interesting himself in hobbies, such as stamp collecting, photography, or astronomy. One general rule to be followed in developing asset qualities is to select activities in which one is certain to have some measure of success. This usually requires the services of a psychologist.

Effective living is largely a matter of balance. Let one force operate too strongly and the balance is lost. Compensation is wholesome if the new activity is well chosen and balance maintained. The compensatory reaction to inferiority can cause a man to strive very hard to achieve success in some activity. Some of our greatest scholars have become great because they felt themselves to be inferior in social ease and tried to compensate through scholarship for their failure to get along with people.

But sometimes the results are not so desirable. Oftentimes the reaction to frustration becomes actively aggressive. These aggressions may serve to make the individual unpopular with his acquaintances or may lead into socially objectionable behavior, as in the case of the classroom bully. The frustrated individual says (by his actions, for he usually does not understand his own motives), "If I can't make people respect me, I can at least make them fear and hate me." The little man who talks too loudly and too much,

always itching to fight a bigger fellow and well deserving the nickname "Bantam," illustrates overcompensation to a feeling of inferiority. Several years ago, a gangster, finally arrested after terrorizing a whole countryside, proved to be an ugly and cringing runt who had received through his banditry attention which he could not earn by honest endeavor.

Certain phases of history and certain kinds of social statistics furnish good examples of this type of reaction to conflict. Aggressive acts are more numerous during periods of economic depression. Hovland and Sears have pointed out a significant correlation between lynchings and hard times.<sup>2</sup> During periods of depression, the number of lynchings is high; during prosperity, their number declines. Lynching is an act of aggression growing out of the conflicts and frustrations imposed by economic depression.

3. *Flight into fantasy.* The person in whom a drive is thwarted frequently finds satisfaction in imagining that the drive is satisfied.

A. Night-dreaming and day-dreaming. Satisfaction may come from night-dreaming or day-dreaming. During the last stages of the World War the dreams of Polish children were carefully studied. The frequency of dreams about food was much higher than the normal for children of the same age.<sup>3</sup> These children were, at the time the study was made, in a critically undernourished condition. They dreamed and day-dreamed of the satisfactions which their material environments could not give them. Even normally, young children day-dream of food more often than do those who are in their teens. The latter dream of love more frequently than do the sexually immature children.

The flight into fantasy can take many forms. There is the "conquering hero" who imagines himself badly wounded and slowly bleeding to death, leading his small handful of faithful soldiers victoriously against the superior forces of the enemy; his subsequent return and miraculous recovery; and the crowning moment of his life when the king pins a medal for bravery upon his manly chest. Or perhaps he is the great surgeon who has been called from a distant city to perform an operation for which he alone has the skill and daring. World-famous physicians and scientists crowd the amphitheater and look on in reverent awe as he saves the life of the President's only child. Perhaps his thwarting

has been sexual. Then his life of fantasy finds him surrounded by beautiful women who plead with him to accept their love.

Or, again, he may be a "suffering hero." "People don't appreciate me now," he broods in the solitude of his room, "but all that will change. I think that I am sick. That queer pain in the pit of my stomach is certainly a cancer. I'll probably die a slow and painful death. Then people will be sorry they picked on me."

Still another example is the second string athlete who sits on the bench and day-dreams of the time when the coach will recognize his ability after it is too late to win the conference title.

Oftentimes the person who flees reality does not create his own dreams. He buys them ready-made in the form of movies, adventure stories, love stories, etc. The essential mechanism here is that of identification. The thwarted individual, as the hero of a pulp magazine story, rides the purple sage with his two six-shooters roaring; or, as the handsome actor in the period play, he challenges his rival to duel. Perhaps he feels that society has not given him a chance, and, turned against his fellow man but lacking the courage to act, he identifies himself with the gangster of real life. When a famous gangster was shot down several years ago by Federal officers, an onlooker was heard to remark bitterly: "They shot him down in cold blood. The dirty rats didn't even give him a chance to draw his gun." There is a well-known American folk song written in sympathy for the bandit Jesse James.

A recent analysis of preferences in entertainment shows that the general public, confused by the world situation and afraid of the future, are favoring escape entertainment rather than movies and stories which face problems squarely.

The flight into fantasy for temporary relief from conflict is characteristic of everybody. It is abnormal and dangerous only when it occurs too often or too strongly and when it leads to no constructive action to give material shape to our dreams. The day-dream can be of great inspiration to the individual who actually tries to create in real life the things he has created in fancy, but when fantasy becomes more satisfying than the real thing, we quit working for the real thing. Our mental hospitals contain many individuals who are starving to death while in their inner dream life they are attending great banquets, eating dishes prepared by the

best chefs of the world, and drinking vintage wines. Here again, the ideal of the wholesome and effective personality is balance and control.

3. How to control your night-dreams. In general, night-dreams of an unpleasant nature are indicative of emotional conflict. Persons who are afflicted with nightmares and unpleasant dreams can suffer much inconvenience from them. The best way to prevent dreaming is to solve the conflict of which the dream is but a symptom. There are, however, some tactics which will give immediate relief. Arnold-Forster experimented widely upon conditions under which dreams occur and developed a technique for dream control. The individual is to repeat this formula to himself: "Remember this is a dream. You are to dream no longer."<sup>4</sup>

This procedure, unfortunately, will not always work. Further control of dreaming can be effected by seeing to it before retiring that the external conditions are conducive to sound slumber—the room temperature controlled, the bed comfortable, the bedding light-weight but adequate. Especial attention should be paid to the condition of the lower viscera. The bladder and colon should be emptied. It is unwise to retire too soon after eating a hearty meal, although drinking a glass of milk before going to bed may promote deep slumber. Many persons report that drinking coffee just before retiring will cause dreaming. If you have been working late, it is well to stop and relax for a few minutes before turning in. A short walk is helpful if the weather permits. Do not permit yourself to become overtired. The sensations of extreme fatigue are frequently responsible for dreaming.

4. *Nomadism*. Superficially, nomadism is the tendency to wander from place to place even when there is no economic gain thereby. This nomadic reaction represents an attempt to get away from a conflict. It doesn't work, because the conflict goes with you. Hundreds of thousands of individuals move about "just to be going." They beat their way on trains, "hitch-hike," stowaway on ships, or even walk. The migratory worker who wanders about following the harvest is motivated by economic needs, and his behavior is normal.

In milder form, the tendency toward nomadism is often evidenced by frequent moving from town to town, by frequent chang-

ing of residence within a community, by frequent divorce, or by excessive changing of occupation. The recent growth of interest in automobile trailers is indicative of increasing wanderlust or nomadism in the population of the United States. It is more than coincidence that this interest grew rapidly during the depression when so many of our ambitions were frustrated.

5. *Rationalization.* Rationalization is the ascribing of false motives to one's behavior. It is another way of bolstering the ego. We all rationalize at times, but we recognize it in the other fellow more often than in ourselves. The danger is that we may go so far in the protection of our egos that we have no time for action but spend our days in building up elaborate excuses for our failures or in explaining away things we are ashamed of having done. Rationalizing takes many forms. There is the "sour grapes" attitude so well told in the old fable of the fox who decides that he does not want the bunch of grapes when he learns that he cannot get it. The jilted lover suddenly remembers that his former sweetheart had certain flaws. Then there is also the "sweet lemon" reaction as exemplified by the philosophy of J. M. Barrie—"Not in doing what you like, but in liking what you do is the secret of happiness." A little of this is fine, but it is something like garlic in that a little goes a long way.

Most familiar as rationalizations are Alibi Ike's classic words: "My hand slipped," "The sun was in my eyes," or "I would have passed, but the teacher had a grudge against me."

There is a certain medical man who refuses to admit the value of vaccines in the treatment of diseases caused by germs. He stoutly maintains that such well-accepted medical practices are without validity and even dishonest. The persistence of his belief in the face of what most medical experts consider to be overwhelming evidence in favor of the use of vaccines has an interesting history. As a young man this physician was a ship's surgeon. During an epidemic among the passengers of his ship, he resolved to give every child a protective injection of the proper serum. At that time he was obviously a believer in the use of vaccines. During the process of injecting one child, the patient involuntarily coughed in the physician's face. Since the disease in question is communicated mainly by contact with the sloughed-off linings of



the throat, the doctor became frightened for his own health and injected the remaining supply of vaccine into his own blood stream. Several of the untreated children died.

In this experience we have all the elements of a profound conflict. Physicians take an oath to put the consideration of their patients first. By injecting the life-saving vaccine into his own body, the physician had committed an unethical act which he could not tolerate. But, if the idea of vaccines were hollow, then no harm would have been done, and there would have been no cowardice in his injecting himself rather than saving the serum for his patients. Thus his belief that vaccines are of no value represents a rationalization which protected him from conscious recognition of his selfish and unethical conduct.

6. *Hysteria: Escape through simulation of physical ailments.* One investigation of failure among college students showed that those who did the least studying were most likely to get eye trouble just before the final examination, when only physical ill health could keep the mark of failure off the record. Most of us have noticed that the headache is always worse when there is a disagreeable task to be done or an unpleasant situation to be faced. Such reactions are common to all and are well within the realm of normality. But these same reactions in extreme form can become seriously maladaptive.

Rogers, a student who was working his way through graduate school by serving as a laboratory assistant in a large science course, complained that he had severe headaches at regular weekly intervals. The headache usually came on about lunch time on Wednesdays. He explained to the psychologist to whom he finally came for help that he thought that his stomach was out of order in some fashion. His physician, however, had been unable to find anything wrong and had advised the young man to "relax" and "take it easy." But the headaches continued to come on just before or during his lunch hour on Wednesdays. In the course of general conversation the psychologist asked Rogers which members of his department were in his opinion the most competent as teachers. Several names were mentioned, but the list did not include the name of Professor Y, who had the best reputation of them all as a teacher. When asked about Professor Y, the student replied that he was very much overrated as a teacher and was in fact a conceited bore.

Since the student was assisting Professor Y in the laboratory instruction

and in grading examination papers, the psychologist decided that the point was well worth developing. In the following conversation it came out that Professor Y had criticized his assistant before the members of the class. The situation between Rogers and his superior was made more tense when Professor Y criticized the boy for having dates with one of the girls in the class and asked him to discontinue. Rogers finally admitted that he thought that his chief was secretly in love with the girl, but since he was a married man could do nothing about it but make life miserable for his assistant.

When the psychologist asked if the headaches had anything to do with his difficulties with his superior, Rogers answered that he could see no connection between the two. The psychologist then pointed out that the headaches came on the very day that he had to assume the inferior role as assistant to the man he disliked, that they had not started until the strained relationship had sprung up, and that the whole affair was something of a tempest in a teapot and not to be taken too seriously. Rogers was assured that Professor Y really thought very highly of him and had been heard to make favorable comments. The psychologist further assured him that the ruling with regard to an assistant in instruction going with girls in his classes and whose papers he graded was a matter of college policy and had no personal significance. Rogers was further advised to have dates with some other girl until the end of the semester, or at least to wait patiently until the semester was over. A couple of talks along these lines were enough to banish the headaches.

Rogers had started to meet an uncomfortable situation by flight into the simulation of illness. His conflict was not strong, and by consequence the escape mechanism was not so extreme as that of the following example, but the two reactions are very much the same in that both represent escape mechanisms.

The cases of shell-shock in war are good examples of the flight into simulated physical disability to avoid conflict. We are not referring to deliberate and conscious malingering. The psychological defense is usually more subtle and often completely without conscious intention. Let us take a case.

This patient was a private, aged 25, who had distinctly low ideals. He fought for six months and claimed to have enjoyed this first period of fighting. It was terminated, however, by an accident when he fell into a deep dugout, fracturing both his ankles, and suffering frost-bite before he could be taken back to the hospital. This experience seems to have given him a distaste for the war. He was back in England for three or four

months, and then did not wish to return to France so soon. Even on the way back he began to be frightened at the prospect. He was kept for two months in barracks and then went up to the line. He approached the trenches feeling quite anxious and, on arrival, got immediately into a panic but was saved from further difficulties by being wounded through the thigh almost at once. This was a minor injury, but it necessitated his remaining in a hospital for a couple of weeks. This hospital was exposed to occasional shell fire, and the patient found that he was constantly starting at the noises and now and again had nightmares of fighting, although he would sleep through many nights without any disturbance whatever. He was then sent back to his base for some time, where he had no more nightmares at all, but was still "jumpy" when any particularly loud noise would occur. A fear of going back to the line had by this time become a settled part of his character. He was returned for three weeks to the trenches, during which time he was constantly in fear but developed no symptoms whatever. This brief period of fighting was again terminated when he received some superficial wounds from fragments of a shell, and this time he was fortunate enough to be sent back to England for five months. He returned again in May, 1916, and fought until September. During this time one gathers that he tried hard to work up the symptoms of appendicitis and trench fever but was never able to convince the medical officer that there was anything serious the matter with him. He was frightened, of course, but always slept well and had no nightmares. In the middle of September he saw one of his comrades run over and crushed by a tank, and, for the first time, he felt horror. From then on any sight of blood affected him. Two or three hours after this unpleasant experience he was shot in the right forearm (another flesh wound), which caused his removal to a dressing station and then to a rest camp. He was in the latter for two weeks, during which time he felt constantly afraid of returning to the trenches and was very loath to get better. From the rest camp he was sent to the base to join another battalion, and was then thrown into the line again. He was there for three days, during which time he suffered considerably from his horror of bloodshed and from his constant fear. He was therefore much relieved when after only three days' fighting he fractured his left collar bone and left wrist. He was sent back to a casualty clearing station, and was only too glad to give a pint and a half of his blood for transfusion as he was rewarded for this by being shipped home to England. After a few weeks his left arm came out of the splint, when he discovered (probably not without satisfaction) that his arm was paralyzed. He remained without the use of this limb for five months, during which time all kinds of treatment were attempted. He was then sent to a special hos-

pital, where simple methods of re-education resulted quite quickly in the steady return of strength to his arm. It is interesting to note that once his hysterical paralysis began to improve he developed some nightmares.<sup>5</sup>

The soldier found in the condition of paralysis an escape from the conflict between his distaste for death and killing on the one hand, and his fear of discipline on the other. We must not conclude that the soldier was deliberately choosing paralysis as a way out of his difficulty. Had his choice been deliberate and well-planned, it would have involved some less disagreeable mode of reaction, something which would not have interfered so greatly with the pattern of his life.

7. *Neurasthenia*. Neurasthenia, closely related to hysteria or the simulation of physical ailments, is usually called "nervous breakdown" by the layman. Neurasthenia is a condition of increased awareness of bodily sensations in the absence of physical causes. The sensations are usually unpleasant. The individual has aches and pains, feels tired all over. His ears may ring and buzz; his heart seems to be behaving badly; he sees specks in front of his eyes. All of these symptoms may result simply from paying too much attention to oneself. As a result of this close attention to one's body, sensations come into consciousness that have never been experienced before. The individual does not know what they mean and seizes upon them as an excuse for his failures. Eventually he reaches a point where he "enjoys ill health."

Helen T. was a twenty-year-old college student with an excellent academic record. In her senior year she developed an illness with an imposing array of symptoms which made her feel for a time that she could not continue in college. Helen had digestive pains after every meal, was constipated, and underweight. She suffered from insomnia to the extent that she was seldom able to sleep before two or three in the morning, but once she got to sleep she was quite likely to sleep until noon, missing her morning classes. Throughout the rest of the day she felt dull and tired; any little exertion fatigued her excessively. In addition to these physical symptoms, Helen was melancholy, avoided the company of her friends, and was very irregular in her habits. She ate at odd hours or not at all, avoided all activity, and neglected her work. The case looked like a generally run-down physical condition, as indeed it was, but it was also a very typical picture of a non-adjustive emotional reaction of the neurasthenic type.

Helen was the only child of parents who were both professional people. Her childhood had been somewhat spoiled and pampered, but she had made remarkable school progress due partly to her good ability and partly to the bookish emphasis of her home which placed a great premium on intellectual accomplishment. Helen's childhood play was largely solitary; and she avoided active muscular games, which resulted in a self-centered and non-social attitude. In adolescence she found herself awkward, not very attractive, and distinctly lacking in social graces. She developed strong feelings of social inferiority, which were partly compensated by her superiority at school. A severe illness when she was fifteen years old kept her in bed most of the time for five months, which undoubtedly increased her withdrawing tendencies. Helen was deeply religious. Her one continuous social activity had been in church and Y. W. C. A. affairs, and this interest had been continued in college. Her attitude was very moral, especially in regard to sex.

Six months before the onset of the ailment, Helen had fallen violently in love with a man ten years her senior, whom she had met in her church work. Her affections were reciprocated for awhile, and there was sufficient demonstrativeness that, while the affair did not really go very far, Helen experienced a severe moral conflict. Her attitude was alternately ardent and yielding, and then extremely moralistic. The man, who was a very matter-of-fact person, tired of her vacillation between amateness and preaching, and broke off the relationship. Since Helen had few other social outlets, she reacted very seriously to the break. This love affair had been an adjustment to her severely thwarted sexual and social motives alike, and its end was a catastrophe to her.

At about the same time two other adjustment problems were developing. Through discussion in student groups and through her studies in some science courses, Helen's immature religious conceptions were becoming weakened, and as yet she had no philosophy of life with which to replace them. Also, her graduation approached and, having no particular vocational aim and being prepared in no special field, she did not know what she would do after leaving college. Both of these problems left her frustrated and disorganized and in an intense emotional state.

Helen reacted to her difficulties by a vague and diffused set of visceral symptoms. The physician whom she consulted gave her pills (prescription unknown) and reassurances. He also recommended active physical exercise, cold baths, and strict adherence to a routine of rising, eating, and going to bed.

The symptoms disappeared in another month or so. The physician's advice was very sound, but the solution of Helen's adjustment problems was

probably the more effective cure. She decided on the vocation of teaching, and on continuing in summer session to pursue special work in that field. She was elected to an honorary society which gave both social recognition and some active duties. Of even greater importance was the fact that she made the acquaintance of another young man whose interest in her provided recognition and also social and, broadly speaking, sexual outlets.<sup>6</sup>

Neurasthenia is difficult to diagnose. The symptoms of neurasthenia can occur from purely physical causes. It is important that we determine whether a given case is really neurasthenia or is symptomatic of a physical ailment. If the latter, rest may be required; the neurasthenic, however, should be encouraged not to rest but to try to lose his anxious self-regard through social activity and other contacts with the external world.

8. *Logic-tight compartments.* A conflict between two opposed drives can be avoided by keeping them apart in consciousness. A certain system of ideas is sealed off, as it were, and allowed to function in isolation from conflicting ideas. People with logic-tight compartments act in a contradictory manner. They do or say one thing in one situation; in another they may do or say something quite incompatible with their former stand and never recognize this inconsistency.

Examine the following statements. "These radicals are ruining this country. They have no respect for law or order. They are always fomenting strikes and violence. If I had my way, we would organize the vigilantes and tar and feather every red in the country." The close juxtaposition of these contradictory ideas makes obvious the fact of their author's logic-tight compartments. In one breath he holds out for law and order; in the next, he advocates illegal violence.

We all have our prejudices which we keep in logic-tight compartments.

9. *Delusions.* A strong belief which is opposed to the reality of the situation and which refuses to respond to logical persuasion is called a delusion. Delusions are common symptoms of certain kinds of mental disorders. Although there is no fine and narrow line which marks off the pathological from the normal belief, the following case is clearly one of abnormal belief engendered by a severe emotional shock.

An unmarried woman of fifty-two, while working in a certain establishment, met casually a man who paid little attention to her. Some time after their meeting she was convinced that the man was following her. She says that one evening as she was standing on the street she saw this man going by with the chief of police and heard him ask the chief whether he might follow her. Since that time, she declares, he has done everything in his power to ruin her reputation, following her from town to town and annoying her in every way. As soon as this man arrives on the scene, she notices a "change in the atmosphere"—people have no more to do with her. This idea has taken such root in her mind that she will talk about nothing but this pursuit. Working in league with the man, she says, is a woman for whom she (the patient) worked at one time. The pursuers travel in automobiles, changing from one make to another in order to fool the patient. The reason given by the patient for this pursuit is that the woman pursuer is in love with the man and is afraid that the man is also interested in the patient; so she makes him follow the patient and torment her. She follows the trail to witness the torture and so assure herself that the man cares only for her and not for the patient.

Here is a queer distortion of rational processes. It started from the patient's hidden desire that the man should follow her. This desire she dared not admit to herself, so she expressed it as a fear that she was being followed by him. This fear she changed to an actual affirmation. Her wish to be pursued by the man is gratified by the idea that the entire time of these two people is taken up in a vain chase after her.<sup>7</sup>

Delusions are of several types and may be roughly classified as primary, secondary, and hypnotic.

A. Primary delusions. The primary delusions are of three main types, most common among which is the delusion of grandeur. Here the afflicted person believes himself to be a man above other mere mortals. In his own thinking he is God, Napoleon, a king, a millionaire, or a great inventor.

A second type of primary delusion is the delusion of reference. In this case the individual misconstrues chance happenings as being directly aimed at him. If two people are seen in earnest conversation, he immediately concludes that they are talking about him. If his bed is changed to a new position in the ward, it is because the attendants are displeased with him and want to guard him the more closely, or because he is being rewarded for good conduct. Nothing is too trivial or too accidental to escape notice as having some personal significance.



Third, we have the delusions of persecution. The writer during his experience on the staff of a mental hospital once saw a woman who believed that the evil King of Siam was persecuting her by somehow controlling her thoughts through radio waves. She lived in mortal fear that *he would eventually drive her insane*. Delusions of persecution are often found with delusions of grandeur. The patient is a great man, but he is opposed by evil forces.

B. Secondary delusions. Secondary delusions are developed by the afflicted person to account for the discrepancy between the primary delusion and the present realities. A patient who believes himself to be St. Peter is asked why he is scrubbing the floor of the hospital ward. He replies that he has been sent to earth in disguise to find out which persons are obeying the will of God and which ones are not. He will explain that he is keeping a list of the moral transgressions of patients and staff members and that the evil-doers will be punished even as the good will be rewarded.

The development of such secondary delusions is evidence of the great faith the individual has in his original delusions. To him they are so real that it never occurs to him to question them. If they are discrepant with what other people say, then the other people must be wrong.

Moss Hart, the playwright, received a fan letter about *Lady in the Dark*—his play about psychoanalysis based in part on his own experiences in visiting a psychoanalyst. The letter read: "I've read all about your visits to the psychoanalysts and the play you wrote about it. Buck up and have courage, Sir. I used to be just like you—in exactly the same state, and I'm all right now. So cheer up."

The writer of the letter signed his name and gave his address as *New Jersey State Hospital*. This institution cares for the insane.

C. Hypnotic delusions. Hypnotic delusions can be best differentiated from other kinds on the basis of the nature of their genesis. They are produced under hypnosis and are temporary. To an observer who did not know that the subject was hypnotized, however, the hypnotic delusion could easily be mistaken for one arising out of emotional conflict.

There is nothing mysterious about hypnosis, which simply represents a highly suggestible state into which the willing subject is induced by the operator. The methods of inducing

hypnosis are numerous beyond description here, but they all follow the same principles. The subject places himself without mental reservation under the direction of the trusted operator who should for the best results be a well-trained person of considerable prestige—a physician or a professor of psychology. The operator starts by asking the subject to execute without reserve some simple task, such as lying down on a couch. At this point he is told something which is obviously true, for example, that the room is quiet, the lights are low. Next the subject is told a partial truth and is asked to execute acts which are slightly out of the ordinary. For instance, he is told that his eyes burn and that his eyelids feel heavy and at the same time is required to fixate his gaze on some bright object or to follow with his eyes the movement of the operator's hand or to open and close his eyes upon command from the operator. In the third stage the subject may be led to believe the obviously untrue, i.e., the suggested delusion, and to perform acts which he would not ordinarily think of doing and which might even be considered by the subject to be impossible. All this time the operator is speaking in a monotonous tone of voice. Once the subject is well hypnotized, he can be given the suggestion that he is Napoleon, a dog, or a beggar. The well-hypnotized subject will then act his part to the best of his knowledge of the character concerned. It is not possible for a hypnotized person to perform some physically impossible feat, such as floating through the air, although one can create in him the delusion that he is doing so. The good operator does not attempt to hasten the process of hypnosis. The time required to induce hypnosis varies from a fraction of a minute to an hour depending upon the skill of the operator and the willingness of the subject.

Hypnosis is best left in the hands of the expert. There are certain precautions to be taken in hypnosis which the amateur might not fully understand. It is important, for example, that suggested delusions be carefully removed during the period of hypnosis. Otherwise they can have somewhat the same effect on a person's later adjustments as other types of delusions exert. Amateur hypnotists will have little difficulty in learning the technique of inducing the trance state, but they are not to be trusted to recognize and cope successfully with some of the possible after-effects.

In the hands of the competently trained operator hypnosis has certain diagnostic value and even a rather limited usefulness in treating emotional difficulties. Leave hypnosis to the expert. It should be practiced in the research laboratory and in the clinic, not in the parlor.

Delusions, whether arising out of emotional conflict or induced in hypnosis, are simply exaggerated forms of the prejudices and false beliefs which we all have. In some ways actual delusions are less confusing because they are obvious enough to be recognized for what they are. Subtle prejudices of clever people frequently masquerade as profound insights into important affairs.

Some delusions are so confused and illogical that they are easily recognized. Such delusions are called *unsystematized* to distinguish them from the *systematized* ones so far described. The following verbatim report of a mental patient illustrates the unsystematized type of delusion.

I was just sitting there with the officials of the universities and the senators and all the farmers' associations of all nations. I was there communicating with them all. They all drifted to my corpse and I explained to them what they wanted to know. I translated things for them. I told them how to run their locomotives so that they can save coal. This compressed air tightens up the valves so the men can breathe easier. Coke and waste will come to an end but air will never come to an end. To operate, they get water and compressed air and put it into a fire box so it can form steam in the boiler. This makes air pressure, and it works and then they use it in cooking pressure. All the senators were there and President Coolidge and George Brittain and William the Great and the President of France. All of them in the same clique. Then two officers walked into the lobby and escorted me to the Chicago Avenue police station and they let me talk to the judge.<sup>8</sup>

D. The treatment of delusions. Delusions, like other mental deviations of emotional origin, must be treated at the source. The delusion is essentially a protective mechanism. The psychiatrist or psychologist in charge of the case must first find out what it is that the patient is trying to protect himself against. The next step is the building up of the correct attitude toward his problem. When acceptable expressions have been suggested and accepted, the delusion will no longer be needed and will usually disappear. To be successful, treatment of this sort must be started in the early

stages of the development of the delusion. Attempts to remove delusions directly by logical persuasion are rarely effective. Such attempts usually result in some modification of the original delusion in which the person who attempts to persuade is incorporated as an enemy.

10. *Repression.* Another way of handling the conflict is to repress it. Repression is related in certain ways to ordinary forgetting, but it is not quite the same. The person in conflict may try hard to forget one or the other of the tendencies, only to have it pop up again. Repression often leads to strange disorders of the personality. One of these is the split personality, the Dr. Jekyll and Mr. Hyde of Robert Louis Stevenson's famous story. But we need not look to fiction for our cases of split personality. Hart reports the case of a patient suffering from an incurable cancer, who was at first intensely depressed, tortured by great pain, worried about the future of her husband and children.<sup>9</sup> Later, signs of excitement appeared, and she became abnormally joyous and elated, so much so that it was necessary to remove her to a hospital for the mentally ill. She maintained that she was now perfectly well, that her disease had been completely cured. The psychological explanation of this case is obvious. The tormenting conflict between her desires and the hopeless facts of her condition had been solved by a process of repression. The painful reality had been pushed completely out of consciousness.

Remember, however, that repression is a part of daily life. All of us have suddenly realized after it is too late that we have completely "forgotten" some unpleasant duty. Repression is harmful only when it prevents us from conducting our daily affairs effectively or is extreme enough to give rise to hampering expressions of various kinds.

The Freudian school of psychologists has attempted to show that dreams very frequently represent the expression of drives repressed in our waking moments. When some motive cannot be expressed in actual behavior because it is in conflict with our moral principles, it may find expression in a dream. If the motive is base enough according to our ethical values, it cannot be expressed directly even in a dream. It is, however, expressed indirectly. Thus a dream has two parts or contents. There is the apparent

content which we remember and report upon awakening, the *manifest* content. Behind this is the *latent* content, our actual motives which an expert can often detect by studying the symbols and forms appearing in the manifest content. The unconscious process whereby the latent content of the dream is translated into the ethically acceptable manifest content is called the *dream work*.

Dream work involves five important kinds or methods of distortion. All of these changes serve to make the real motive less obvious. One part of our personality disguises itself so that another part will not recognize it.

(1) Condensation. In condensation one motive represents several motives; one idea, word, or person getting into the manifest content stands for several ideas, words, or persons connected with the latent motive but not presentable to our ethical side. The curious term "uclamparia" figured prominently in the manifest content of a dream and was found to stand for eucalyptus and malaria. The latter two words had elaborate meanings in the latent content of the dream.

(2) Displacement. In displacement the emotional reaction to one idea, person, or object in the latent content becomes dislocated and attaches to some item in the manifest content making that manifest content seem more important than it really is. For example, a man dreams that he is seated at his desk when his business partner comes into the office and pushes the dreamer's hair down over his eyes. The latent content of such a dream might well be the suspicion that his wife and the partner are having an affair.

(3) Dramatization. In dramatization the manifest content is a series of visual images. These are seen much as a motion picture and as though they related to some other person and hence do not arouse the full emotion that is attached to them in the latent content of the dream.

(4) Symbolism. Symbolism is the best known instance of dream work but probably not the most frequent in actual occurrence. Objects which are repulsive are represented by symbols which are not of themselves objectionable. Knives, daggers, canes, church spires, trees, and other elongated objects may be symbols for the male genital organ. Houses, caves, boxes, trunks, and similar objects are sometimes symbols for the female organ. Stair-climbing,

flying, dancing, and many others are symbols for the sexual act. To dream of whipping a child may be the manifest content of a dream of masturbation. To dream of walking through a series of rooms in a strange building is the manifest symbol of the latent wish to have promiscuous sexual relations.

(5) Secondary elaboration. The dream work leaves the manifest content rather illogical, disjointed, and lacking in proper time relations. In the recalling or telling of the dream we dress it up a little to make it sound more plausible. This process is called secondary elaboration.

Experts who are familiar with the various ways in which the latent content of the dream becomes changed into manifest content are frequently able to locate a conflict which the individual is no longer conscious of.

11. Regression. In regression the individual in conflict seeks an early infantile level of expression. He flees from the realities and pain of his present life to the protected existence of the child. Regression, like any other reaction to conflict, occurs in varying degrees of completeness. We all show some of it. The philosophy of the "Old Oaken Bucket" expresses the regressive mechanism in its milder form. "Times are not what they used to be." "When I was a boy, things were different." "They don't build houses like they used to." These are typical expressions of the regressive reaction. Morgan gives us an extreme case of regression.

A young girl was in love and was very anxious to marry. The young man she loved was not ready to marry. He wanted to run around and have what he considered a good time for awhile before he settled down. This led the girl to fear the consequences of marriage with such a care-free youth and, aided by the disapproval of her fiancé expressed by her relatives and friends, she tried to decide that she would stay single. Yet she could not bear the thought of remaining single indefinitely. She was in a strange dilemma; she wanted to marry and she was afraid to do so. This led to the wish that she did not have any of the tendencies toward love life. If she were only a child again she would not want to marry and the trouble would be at an end. So she tried again to be a young innocent girl who knew nothing of love. She took the same attitude toward the whole affair that she would have taken when she was a pre-adolescent girl, and she seemed to get satisfaction from this for a time. When this satisfaction did not continue, her physiological maturity eventually forcing her to recog-

nize that she was a woman, she attempted to commit suicide. After gaining insight into what she was doing, the girl adjusted her attitude, took a forward view instead of wishing to revert to a childish stage, and has made a satisfactory adjustment ever since.<sup>10</sup>

Such extreme regressive reactions are rare. Homesickness is a form of regression much more familiar to the student. Homesickness results when the individual is thrown against new problems in a new environment. Finding himself thus in conflict with a harsh reality he falls back upon his thoughts of home, where life was easy, and of Mother, who was always kind. People who are able to cope with a new situation with considerable success do not become homesick. Homesickness is cured by the development of new interests which can lead to successful activity.

There are numerous regressions besides those mentioned which lie well within the limits of normality. It is not at all abnormal to gain reassurance by seeking advice from trusted friends or relatives we have known from childhood. As a general rule, however, the individual should seek to solve his own problems, especially the smaller ones, and reserve for real emergencies the solace to be gained from the sympathy and kindness of friends or relatives. Parents must be skilful in their treatment of children to provide the proper balance between independence and regressive tendencies.

12. *Escape through the use of alcohol and other drugs.* The thirst for alcohol is not like the thirst for water. Alcoholism is not primarily a physiological but rather a psychological habit. Individuals become slaves to alcohol not because their bodily tissues demand it but because alcohol gives a temporary escape from the realities of life. Under the influence of this drug a person's sense of values is altered and his judgment of consequences is impaired.

It is true, of course, that continued use of alcohol brings about bodily damage which only the physician can repair. At this advanced stage alcoholism is a medical problem. During its beginning stage it is a psychological problem. Experience of psychiatrists and consulting psychologists shows clearly that the patient who does not truly want to quit drinking can never be permanently cured of his drinking habit. Even when the patient believes



and says he wants to quit, the internal and external forces that caused him to acquire the habit must be eliminated before the habit can be eliminated.

The line between social drinking and alcoholism is a fine one indeed. The chronic alcoholic usually denies that he has crossed the line. Solitary drinking is usually the sign of alcoholism. Solitary drinking again is hard to define. The individual who buys a bottle of whisky and retires to his room to drink it is certainly a solitary drinker. How about the stranger who sits by himself at the end of a hotel bar and gets quietly drunk without saying more than "Another one of the same." Is this solitary drinking? The passage from social drinking to solitary drinking is purposely made easy as a means of stimulating the sale of liquor.

### *Direct attempts to resolve conflicts*

Fortunately most of our daily problems can be solved directly, without recourse to the indirect means just discussed.

In many conflicts the opposing forces are obviously of differing strengths. For example, suppose it is the night before an examination. There is a good movie you would like to see, but you are very unprepared for the examination, and it is one which will determine your year's grade. Let us say also that you need a particular grade in this course in order to stay on the football team and that the movie is one you will probably have another chance to see. Here the conflict will be so slight that there will be little or no difficulty in resolving it. Suppose, however, that it is a movie you have been waiting especially to see, one that will be of particular value for another course you are taking, and one that you will not have another chance to see. This will create a larger conflict, and if, in addition, you have a friend visiting from out of town, as anxious as you to see it but refusing to go unless you go too, you will be facing an even stronger conflict.

In such a case the only thing to do is to examine systematically the pro's and con's, preferably listing them on paper. In this way all the many factors can be brought together and weighed and their relative merits determined. The decision can be in accordance with what is apparently of the greatest net value. The decision once made should be adhered to.

Some conflicts result from incomplete knowledge of the facts and disappear at once when the necessary information is obtained. Examples of this type are trying to decide which of two new places to go on your vacation or which of two courses to enroll for. Further information about the possible alternatives will usually aid you in your choice by either dissolving the conflict entirely or rendering the two conflicting forces of obviously unequal strength and value. Many familiar college problems are of this type. Let us take as specific examples three conflicts which confront practically all college students at some time or other: activities versus scholarship, "independent" versus fraternity life, and the problem of whether or not to try to work part time to help pay expenses in college.

*Activities vs. scholarship.* College students are given to a particular brand of wishful thinking which sometimes assumes the position of an outright false belief. "Don't let your studies interfere with your education" is one way of expressing this sort of wishful thinking. Is this position justified? Without a clear knowledge of the evidence on this subject the student will find himself in a real quandary. Which *is* the wiser course? How can you best utilize your college opportunities in preparing for later life?

Several studies of this question have been made, all with similar results. President Gifford of the American Telephone and Telegraph Company has reported the results of an extensive statistical analysis of the records of his college-graduate employees in relation to participation in campus activities as against scholarship.<sup>11</sup> Contrary to student superstition, the person who excelled in scholarship will earn a larger salary throughout his whole career than will the student who was equally active in campus affairs but lower in scholarship.

The experience of the Telephone Company confirms the results of an older study of the graduates of Wesleyan University, which showed that of the living graduates of the period 1860-1889, 50 per cent of the men who had graduated with honors were listed in *Who's Who*, while but 10 per cent of those who had graduated without honors were listed.<sup>12</sup> That success in college goes with success in life is established beyond any doubt for this group.

Gifford's figures and those from the Wesleyan study do not imply that student activities are not worth while. Gifford's study showed clearly that students who excelled in such activities as debating, student publications, and others not including athletics earned higher salaries than those who did not participate at all. The point is that scholarship is of more value than activities in predicting later earnings.

Tunis studied the records of the lives of 541 of his classmates of Harvard, 1911, between the year of their graduation and that of their class reunion twenty-five years later.<sup>13</sup>

He picked at random 100 names from each of four different groups—Phi Beta Kappas, clubmen, average men who were not well-known in their college days, and athletes. The Phi Beta Kappas led the list in earning power, the clubmen came next, the average men were third, and the athletes last. His results are the more astonishing for the fact that the average group had been made up mainly of boys of moderate financial condition whereas the athlete group contained many sons of rich men with influential business connections. Do not be misled by the sort of wishful thinking which holds that hard study is not worth while and that athletics and social activities are the things that win in the race of life. The record points too strongly in the other direction.

Fame and fortune seem to go first to the individuals who succeed best in their studies. Do these people, through emphasizing the scholarly life in college, sacrifice social effectiveness even though they gain fame and fortune? Young answered this question by having Colgate University freshmen rate their college acquaintances on the basis of liking or disliking.<sup>14</sup> He also recorded the number of acquaintances possessed by each student. There was no relationship between scholarship and the number of friends and acquaintances possessed by each student, nor was there any correlation between scholarship and the degree to which a student was liked by his acquaintances. The notion that success in scholarship is earned at the expense of success in human relations was not borne out by Young's study.

When all of the data are assembled for inspection, it becomes quite clear that studying at college, contrary to popular belief, will not blight the student's life after college. The best adjusted

student will combine other activities with his studying, but he will put the studying first.

*The "organized" vs. the "independent" life.* Many college students are called upon to decide whether they should live in or out of an organized group. This decision is usually made under conditions of "rushing" which are not conducive to sober reflection on the facts of the case. However, it is interesting to examine some data bearing upon the advantages and disadvantages of fraternity, as compared with independent, life at college.

Here again, knowledge of the facts is the best antidote for conflict. The clearest conclusion with regard to the effect of fraternity life upon scholarship is that the fraternity is what you make it. Some fraternities provide skilled tutors who help students achieve high scholarship. Other fraternities provide distractions in the form of social life and demand that their members participate in student activities at the expense of scholarship. There is some evidence that the fraternity is a leveling influence. The brighter fraternity men are slightly less apt to make as good use of their ability as the brighter independents; while the less intelligent fraternity men are more likely to make better use of what ability they have than those on the outside. The difference between the average scholarship of organized and independent students is so small or so variable from house to house and from campus to campus that no general advice can be given.

The principal value a fraternity has to offer is in the area of social development. A good fraternity helps teach the individual teamwork and consideration for others. The fraternity is likely to be a leveler here too. Through constant and close association individuals learn that the world is wider than they thought and that customs vary. The standard of the less principled is raised and that of the moral prig is relaxed in the direction of the common path. The fraternity has much to offer the socially underprivileged in the way of teaching manners and other social graces. It presents an opportunity for the formation of friendships with the older men of the alumni and in that way frequently gives the student his first chance in the business world.

The most serious criticism that can be fairly launched against the college fraternity and sorority is that they offer their oppor-

tunities for development to those students who need such opportunity least and tend to withhold membership from the socially underprivileged students from poor homes and undistinguished families.

The choice of a college fraternity is not a very serious decision for the student who is financially able to carry the expense. If you can afford it, if you like the members, and if they invite you, the college fraternity has much to offer. On the other hand, the advantages of the college fraternity are not so great that nonmembership is a handicap in life. Membership in a college fraternity or sorority is no guarantee of success or happiness in life. It is something to enjoy to the fullest while in college. Its real value is there. After college the fraternity will mean less and less to you each year. Although it will often get you an interview, do not hope to use a fraternity connection as a substitute for ability and hard work in getting and keeping a job. Fraternity "brothers" are a drug on the market with most employers.

*Working your way through college.* The American tradition is that the boy who works his way through college will turn out to be a stronger person than the one whose way is paid in full. The evidence from various studies on the relationship between quality of scholarship and employment seems to be that a moderate amount of working has no effect on scholarship. Students who want to go to college badly enough to work part of the time to help support themselves prize the opportunity enough to make the most of it.

Freshmen entering the college of Commerce and Administration of Ohio State University in the autumn of 1937 were studied subsequently by Reeder and Newman to determine effect of employment on scholarship.<sup>15</sup> A group of 123 students spent from 15 to 50 hours per week on jobs in the sales field, kitchen and dining-room service, clerical positions, factory and manual work, in service fields, and in various capacities in theaters and in dance bands, the frequencies being in the order mentioned. Another group of 123 students of equal ability, as measured by intelligence tests and high-school records, served as a control group. These did not work. The following findings were true of these 246 college students: (1) With respect to high-school record, 24% came from

the highest, 45% from the middle, and 32% from the lowest third of their graduating class. (2) 49% of the workers and 30% of the non-workers were delayed one or more years in their enrollment. (3) There was no significant difference in the quality of scholastic work done by the two groups.

Shaffner compared the marks of non-workers (employed fewer than 4 hours a week), moderate workers (employed 6 to 21 hours a week), and hard workers (24 or more hours a week), equated as to college-entrance tests.<sup>16</sup> The moderate workers ranked highest in academic success and the hard workers nearly as high. The difference between both working groups and the non-working group was significant.

The results of these two investigations seem to be in agreement in showing that a moderate amount of working (one to three hours per day) need not interfere with the earning of good grades.

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Social living imposes certain restrictions upon individuals which give rise to conflicts. These conflicts can be adequately resolved, or they can be permitted to go unchecked. The failure of adequate resolution of a conflict may lead to many abnormal forms of behavior, even to a nervous breakdown. There are many indirect methods of handling conflict. Among the most common are sublimation and substitution, compensation and overcompensation, flight into fantasy, nomadism, rationalization, logic-tight compartments, delusions, regression, repression, and escape through use of alcohol and other drugs. Some of these reactions can be good in part. In mild form they are normal and are present in all of us. In extreme form they are maladaptive. Effective living is largely a matter of balance. In dealing with mental conflicts prevention is far better than cure. Direct attempts to resolve conflicts are often successful when objective data can be employed.

### *Recommended Readings*

DOLLARD, J., *et al.* *Frustration and Aggression*. Yale University Press, 1939.

A description of the social conditions which produce frustrations and of the behavior which results.

GRIFFIN, J. D. M., *et al.* *Mental Hygiene; a Manual for Teachers.* American Book Company, 1940.

On the Must list for prospective teachers.

MURRAY, H. A., *et al.* *Explorations in Personality.* Oxford University Press, 1938.

Fifty-one college boys are studied by psychologists, psychoanalysts, and physicians.

PLANT, J. *Personality and the Cultural Pattern.* Commonwealth Fund, 1937.

A study of the social factors producing conflict.

SHERMAN, M. *Mental Conflicts and Personality.* Longmans, Green, 1938.

How conflicts arise and how they affect the individual and society.

THORPE, L. *Psychological Foundations of Personality.* McGraw-Hill, 1938.

A comprehensive survey of the literature of all fields of psychology which touch on personality.



PART THREE

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*Knowing the  
World*



*"Keep your eyes and ears open, if you desire  
to get on in the world."* DOUGLAS JERROLD

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## CHAPTER 7

# THE SPECIAL SENSES

*To see is to believe, and so is to hear, to taste, to smell, or to feel.  
Herein the sensory processes by which you know your outer world.*

FROM BIRTH, or even before birth, the human individual responds to the outer physical world and to conditions within his own body through the coöperative action of several sets of sense organs. Psychologists do not yet know exactly how many different kinds of sense organs man possesses. There are certainly more than the traditional five—those of seeing, hearing, touch, taste, and smell.

The really important working parts of any sense organ are the *receptors* (p. 16). These receptors are activated by some force or energy rising outside of them, the stimulus. An energy which is strong enough to produce a response of any kind is said to be above the *limen* (threshold); one of similar nature but too weak to produce a response is *subliminal* (below the threshold). Complex objects and situations become known to us through stimuli to the sense of sight, sound, smell, and touch acting together.

Objects removed from us in space are usually perceived through the senses of sight and sound. Smell also serves to acquaint us with objects somewhat distant in space, but it is not a long-range sense such as sight or hearing. The sense of touch acquaints us with objects in direct contact with our bodies.

In addition to sense organs which respond to situations outside the body, there are some, such as those in muscles and joints, which serve to tell us the positions of the various members of our bodies. Still another group of sense organs tells us about our internal condition, i.e., the state of affairs in our visceral organs.

An efficiently working set of sense organs is essential to effective participation in a large number of occupations. Good sense organs are equally necessary to the enjoyment of many leisure activities. The human being is remarkably adaptive, however. No single sensory department is absolutely essential to life or even enjoyment of living. Blind people learn to read with their fingers; color-blind people are often completely unaware of their deficiencies; deaf people find much comfort in reading; people who lack a sense of taste or smell are not seriously handicapped in the enjoyment of life. The fact that several sets of sense organs work together in telling us what is going on in the world about us indicates that no one set is all-important.

### *Seeing the World (Vision)*

VISION has always been regarded as man's most precious gift. Addison made this point for all time when he said, "Our sight is the most perfect and most delightful of all our senses; it fills the mind with the largest variety of ideas, converses with its objects at the greatest distance, and continues the longest in action without being tired or satiated with its proper enjoyment." We take our sight so much for granted that we sometimes fail to appreciate its value until it is lost, temporarily or permanently. So different is life without vision that the people who train Seeing-Eye dogs prepare for the job by wearing blindfolds for a month. Blindfold yourself and go about the business of living. Such an adventure will give you a new understanding of the importance of vision in daily living. It is true that the permanently blind

learn to compensate to some extent through the finer training of their other senses, but they never reach the point where lack of vision is not a handicap. This does not imply that the blind are excluded from all lines of work. In fact, there are certain activities in which blindness is an asset, because it removes distractions and permits more profound application.

### *Seeing color*

It is reliably estimated that the normal adult can experience 35,000 separate visual sensations of color.

*The classification of colors.* The normal person can classify colors in three ways: on the basis of *brightness*; on the basis of *hue*, or "color"; on the basis of *saturation*, or purity.

Suppose that you had before you a collection of 35,000 bits of colored paper representing all possible combinations of hue, brightness, and saturation. How are you to classify these into as many series as are required to include every single piece so that it will lie right next to one just about like it but noticeably different? The task is not as impossible as it seems. You pick up a piece of paper purely by chance. It happens to be a gray. This gives you a clue. The pieces of paper can be sorted on the basis of *hue* or lack of hue. You deal the bits of paper into two stacks on the basis of whether they possess hue or lack it. The reds, oranges, yellows, blues, greens, and purples go into one pile; the various grays into another. The pile of grays contains about 700 pieces. Some of these are almost black, some almost white, with many gradations between. You see that they can easily be arranged from black to white in one continuous series. This is the *brightness* series. Physically, brightness depends on the intensity of the visual stimulus, that is, on the amount of energy in the light coming to the eye. Light travels in waves, and the intensity is determined by the *height* of the waves—the *amplitude*, as the physicist calls it.

Next you attack the remaining pile of pieces of paper. You notice that there are many hues represented. The physical basis of hue is the *length* of the wave of light seen—called by physicists the *frequency* of the wave. As you look at the various hues, you notice that one hue merges into another. You start with blue,

next to it go the bluish purples, then the purples, then the reddish purples, then the reds. Next to the reds go the reddish oranges, then the oranges, then the yellowish oranges, then the yellows. From the yellows you continue: yellowish greens, greens, bluish greens, blue. You are back where you started. The various hues form a continuous series which doubles back on itself to complete a closed circle, which we will look at in a moment.

As you look at these hues, some seem to be more "real" or fundamental. The yellows and the blues seem somehow more stable than the oranges and the purples and the yellow-greens and the blue-greens. The greens and the reds also seem more stable than the oranges, purples, blue-greens, and yellow-greens. No matter how long or how hard you look at the yellows, blues, greens, and reds, they resist analysis into anything else. They seem to be ultimate and irreducible in consciousness. In the orange, however, you can see red and yellow; in the purple, red and blue; in the blue-green, blue and green; and in the yellow-green, yellow and green. The stable irreducible hues are called *psychological primaries*, because we cannot analyze them into elements through self-observation. (These four psychologically primary colors should not be confused with the three primaries of the artist's pigments.) Psychologically primary red is not found in the spectrum of daylight. It is produced by adding psychologically primary blue to the red of the spectrum.<sup>1</sup>

The very stability of the psychologically primary colors seems to suggest the point from which their further classification should be attacked. You have a full rich bit of blue in your hand. You find that there is another bit of blue that is less full, that seems more faded and muddy. You place that by the key blue and look for another blue. You find some that are more and more washed out or faded. Finally you have a series running from the full *saturated* blue to those so pale and washed out that they are nearly gray. In fact, you have to look sharply to see that they are the least bit bluish. The term *saturation* refers to the amount of hue present. A strong blue is highly saturated; a weak, washed-out blue is one of low saturation. As a hue loses its saturation, it approaches closer and closer to *gray*.

You examine all the blues of a given degree of saturation and

find that even among bits of blue of the same saturation there are still differences in *brightness* among them. Some are dark or near black in appearance, while others are bright or near white. They can be classified on the basis of their brightness just as you classified the grays on that basis. You have now discovered the three dimensions of color sensations—*hue*, *brightness*, and *saturation*.

Figure 24 represents the three dimensions of color sensations as the axis (brightness), radius (saturation), and circumference (hue) of a double cone. Extreme white is at the upper end of the axis of the color cones, since white is the brightest visual sensation possible. Black is at the bottom of the axis, for black is the least bright possible. On this line between white and black are found all the grays. Hues are symbolized as points on the circumference; saturation, as points between the axis and the circumference. The axis represents zero saturation. It so happens that the very brightest and the very least bright colors are least saturated and that the highly saturated colors are of medium brightness. This is symbolized by the double cone shape of the color solid. All combinations of hue, saturation, and brightness are thought of as lying within the boundaries of this double cone. The point labeled mid-gray is the center of the double cone and represents gray of medium brightness.

Figure 25 shows the color wheel. This is simply a cross-section of the color solid cut out (at right angles to the axis) at any level of brightness at which there can be some saturation. Thus the various hues are represented by the spokes of the wheel. Those hues which are found in the spectrum (that is, hues which are components of sunlight) are tied together by a rim drawn in a solid line. The purples, which are not found in the spectrum but must be produced by combinations of spectral lights, are shown by a rim in broken line. The hub of the wheel represents gray.

*The combination of colors.* What happens when two hues are combined, that is, when lights of two different hues are combined? (We must make this distinction between the combinations of lights, and the combination or mixing of paints, for the laws of light mixture are sometimes the same as, and sometimes different from, those of paint and dye mixing.)

A. The laws of color mixture. There are three simple laws



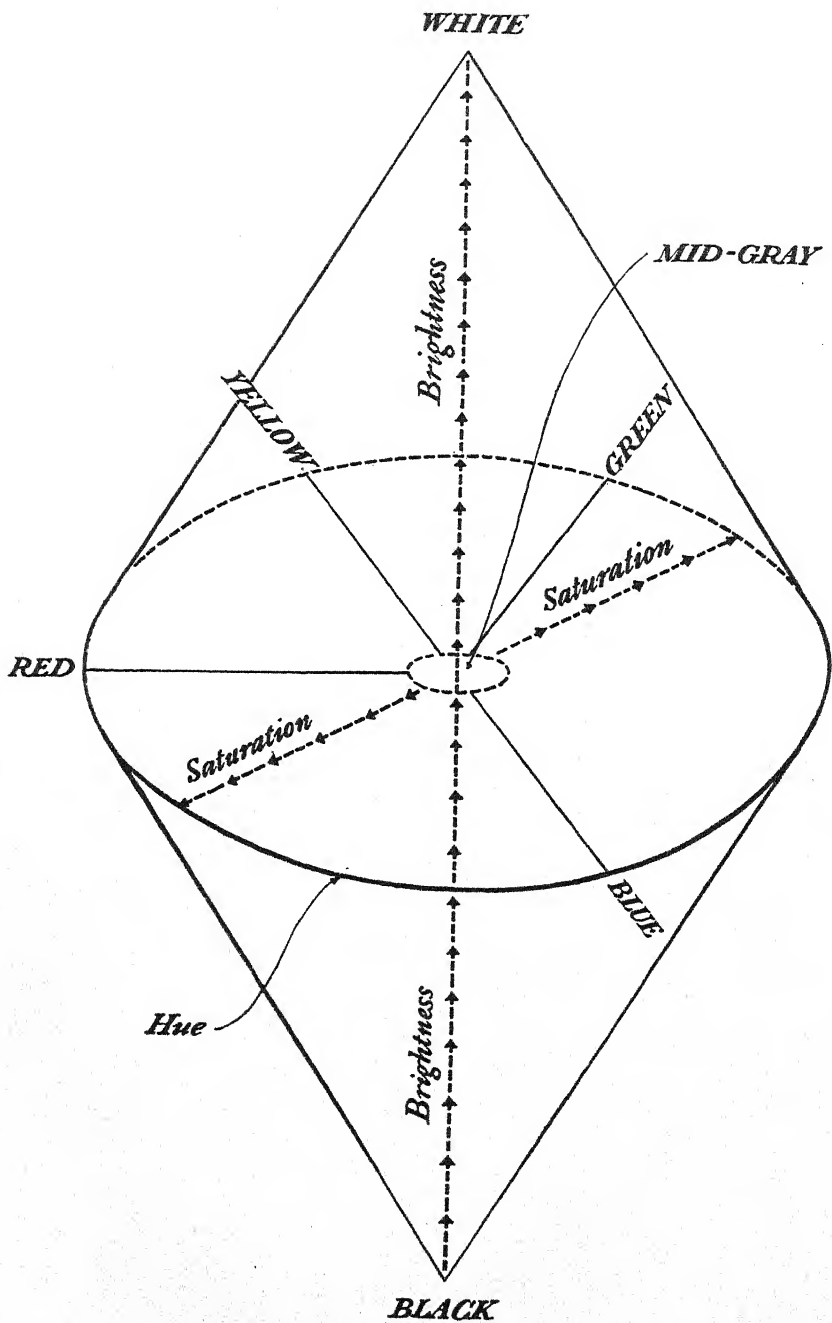


FIGURE 24. The color cone. (See p. 209.)

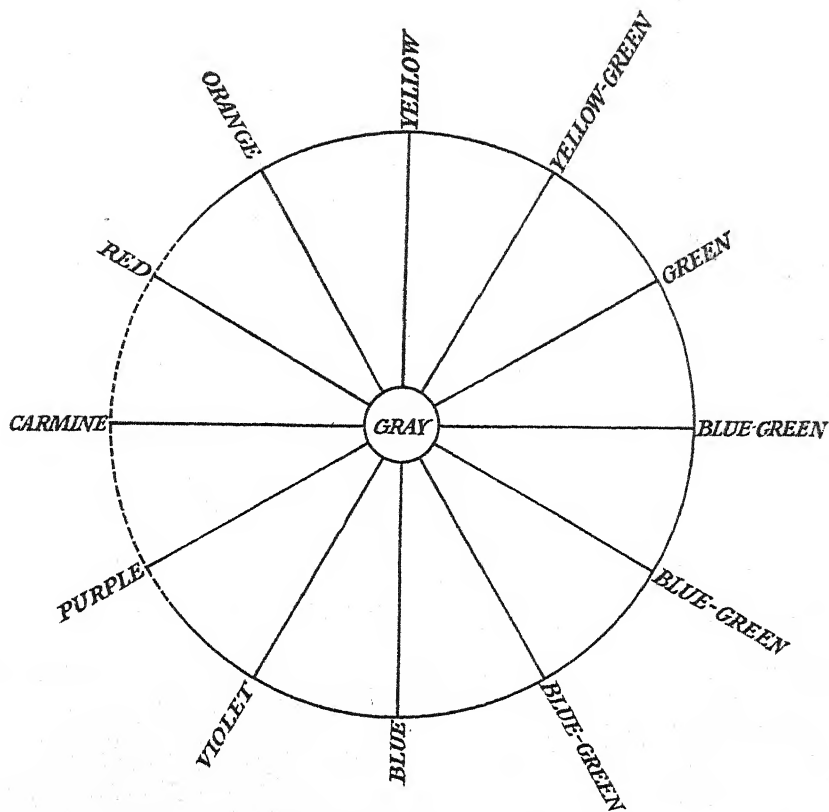


FIGURE 25. *The color wheel.* (See p. 209.)

which describe the results of mixing lights of like brightness but of differing hues. All are illustrated by the color wheel.

Law I. All hues opposite each other on the color wheel combine to produce gray. Examples of such combination are yellow fused with blue; purple fused with green; red fused with blue-green. Two colors which combine to give gray are complementary colors.

Law II. All other hues fuse to produce different hues or blends. Examples of this type of mixing are found in the following combinations and results: red fuses with yellow to produce orange; red with blue to produce purple; red with green to produce yellow; blue with green to produce blue-green.

Law III. Hues which are themselves produced by combining hues fuse according to Law I and Law II. For example, orange

produced by mixing yellow and red will fuse with blue-green to form gray.

To find the results of the mixture of any two colors, merely draw a line from one of them to another on the color wheel. The mid-point of the line will show you the hue of the resultant when the components are mixed in equal proportions. For example, the center of the line passing from yellow to blue falls at the hub, G. And we have just seen that these two complementary colors fuse to give gray. The mid-point of the line connecting red and blue falls in the purple sector, indicating that purple is, as we saw above, the result of combining red and blue in equal proportions. The degree of saturation of the resulting combination can also be determined roughly from the color wheel if the saturations of the colors being combined are known. Psychologically primary green and psychologically primary red mix to give psychologically primary yellow of low saturation. A line connecting the green and the red runs through the yellow sector but toward the gray point. When the hues are not mixed in equal proportion, the resultant hue and saturation correspond to some point beyond the mid-point of the line, the position of which will depend upon how great the difference in proportion is.

The color wheel, since it is a cross-section of the color cones, summarizes only the facts of the mixture of hues of differing saturation. When the third dimension of brightness is added, the problem becomes more complex. When a hue of low brightness is mixed with the same hue of high brightness, the resultant is of intermediate brightness. The same is true of black and white, which combine to give gray.

b. Simultaneous contrast effects. If you place a strip of gray paper on a yellow background, you will observe that the gray becomes slightly bluish. In corresponding fashion place the same strip of gray paper against a background of blue and it will take on a yellowish cast. This effect is known as the phenomenon of simultaneous hue contrast. The contrast effect is always the complementary hue of the background.

Brightness contrast effects, similar to those of hue, can be simply produced. A gray band which runs through a field of white

seems darker than the same gray band running through a field of black.

c. Negative and positive after-sensations. Gaze long and hard at a bit of yellow paper. Do not allow your eyes to waver. You will notice that the borders of the bit of paper commence to take on a bluish tinge. The yellow itself seems to fade, i.e., to lose saturation. After these effects are quite clearly observable, cast your gaze on a piece of clean white paper and you will see a negative after-sensation. It has the complementary hue of the original. Positive after-sensations also occur after an interval of stimulation. Gaze at an electric light for a time and then blank it out with a piece of paper. The light will appear to glow for a short time.

There is another contrast effect, that produced by looking intently at a surface of a particular hue and then gazing at a surface of complementary hue. In this case the second hue is seen as more saturated than would be normally possible. In fact, the fullest saturations are obtainable only by first looking at a light of complementary hue.

A negative after-sensation will mix with an actual sensation to give results predicted on the basis of the laws of color mixture. For example, the negative after-sensation of blue is yellow. If that yellow is projected upon a piece of red paper, the red of the paper and the yellow of the negative after-sensation will combine to give orange. This fact represents a source of error in situations calling for the matching of colors. The chemist and dye-maker must arrange the conditions of their comparisons of samples in such a way that after-sensations will not affect their judgment.

*Perceiving colored objects.* The classification of color sensations in terms of brightness, saturation, and hue is by no means all-inclusive. Visual sensations aroused by objects with which we have daily contact possess certain other characteristics which are called *modes of appearance*. The mode of appearance of a color will depend upon the physical characteristics of the object seen. Psychologists are not certain that all the modes of appearance have been described. Following is a list of the more common ones.

A. *Glow.* Objects which emit light rather than merely reflecting it from another source possess a characteristic quality which is

called glow. The red-hot coal glows as you draw it from the fire-place.

B. Luster. Polished metals have a sheen or luster which is not mistaken for glow or for other modes of appearance.

C. Bulk. A body of water or a piece of colored glass has a certain perceived volume which we call bulk.

D. Film. An isolated color against a neutral field is often seen as a film.

E. Surface. Most of the colors with which we deal in daily life are restricted to the surfaces of objects. The white of the page of this book or the hue of the binding illustrate the surface quality as a mode of appearance.

The artist, in his attempts to reproduce the colors of nature, is restricted to the use of hues having surface quality. It is for this reason that his skies, seas, and sunsets are never quite real. The bulk, glow, and luster of life cannot be put on the artist's canvas.

*Coldness and warmth in colors.* Colors arouse in us feelings of warmth and coldness. Red, orange, and yellow suggest warmth, while green, blue, and the blue-greens suggest coldness. These associations actually have some physical basis, in that red, orange, and yellow fabrics generally absorb more heat than those dyed in other hues of the same brightness. This group accordingly takes on a quality of being warm, active, advancing, vibrant. These colors also appear to be nearer to us than do the less warm colors. Green, blue, and the blue-greens are cold and receding colors. Physically they absorb less heat than the warm group. They are called receding colors, because they seem to be farther away than a fabric of similar size dyed in the warmer, advancing hues.

*How we see colors is influenced by knowledge of conditions.* It is quite possible to arrange the conditions of visual observation so that a person with normal sensory equipment will report incorrectly. In fact, the true color of an object cannot be perceived unless the observer knows something about the nature of the surrounding illumination and is set for it. Ordinarily we are never in doubt as to this. We know whether the day is cloudy or bright, whether a room is shadowy or brilliant. Suppose, however, that you look into a specially prepared chamber which contains a disk of dark gray paper, strongly illuminated from a hidden

source, and other objects of lighter shade but not so strongly illuminated. Under these circumstances the darker disk will appear to be lighter in hue. In general, if the observer sees the light reflected from an object to be brighter than the surroundings, the object is seen as white; if the light reflected from the object is seen as bluer than the surroundings, the object is seen as blue. If a piece of gray paper is illuminated by blue light, the subject who is unaware that the illumination is blue will report the gray paper as blue. Each element is automatically interpreted in terms of the total situation. Where and how this goes on is still something of a mystery.

*How the color-blind see colors.* The essential difference between color-blind and normal individuals is that colors which appear to be different to the normal are seen as the same by the color-blind. Many color-blind persons never suspect their weakness until they take a formal test. Five men in a hundred and two women in a thousand are color-blind. Color-blindness exists in varying degrees from what might be called color weakness to complete color-blindness. In the latter, which is very rare indeed, colors are seen as shades of gray. The most common type of color-blindness is that in which red and green are seen as alike and confused with a faded yellow. Color-blind persons often match the same hues differently, because they can see no difference between red and green and call on their imagination with conflicting results, but they accept the matches made by the person of normal color vision. The laws of color mixing for the color-blind are simply derived from those for the normal person. A person who is red-green color-blind sees orange as yellow, since he is blind to the red component but not to the yellow component. The red component has an effect on him no different from the yellow; purple is seen by him as blue for a similar reason. Accordingly, to find the result of any combination of hues for the color-blind person, you merely ask yourself how each component is seen and then predict the result of the combination of those hues seen.

*Color preferences.* Why certain colors are preferred over others has been a subject of considerable interest to psychologists. It has been found that color preferences vary with different ages and different groups.

A. Age differences in color preference. Even at birth infants respond to light, whether colored or not. Do infants in the first months of life show color preferences? Staples studied this problem with three-month-old babies by holding a sheet of gray paper and a sheet of colored paper of exactly the same brightness or two sheets of colored paper before the infants in their cradles.<sup>2</sup> Interest was measured as the amount of time which the infant spent looking at one piece of paper as compared with the other. The papers were placed far enough apart so that the experimenter was rarely in doubt as to which piece of paper was being looked at. The interest of the various papers in terms of the number of seconds each was looked at favored the yellow, blue, red, and green over the gray. The differences between the various colors were so slight that we cannot be sure whether color preferences exist in infants of around three months of age, but the results did show very clearly that color is more interesting than gray even to a baby so young.

In experiments with older babies pairs of colored disks were employed. The infants were told to "get the ball." Preference was defined as pointing to or attempting to touch the disk. The results showed clearly that eight-month-old infants preferred red to any other color. Following this came yellow, blue, and green. At nine to eleven months the preference for red still held up, but the yellow, green, and blue were much closer in preference than they were in the eight-month-old infants. At twelve to fourteen months red was still first, with yellow standing as second choice, but blue was then preferred to green. In infants of fifteen to eighteen months, red and yellow were nearly tied for first preference, with blue coming third and green in the rear. In children of two and a half to five years of age, red, green, and blue were about equally preferred, but yellow was much farther down the scale of preference. In grade-school children the order of preference was blue, red, and green; yellow had declined still further in preference. In adults, blue was preferred, red and green were about equally liked, and yellow was far down the scale. Part of the explanation for the apparent loss of preference for yellow may be that the yellow used in Staples's experiment and that used in similar ones are usually low in saturation. It is difficult to get a yellow of high saturation. We have already seen that saturated colors have striking quality.



The results of the Staples study may be summarized as follows. At birth babies respond to light whether colored or uncolored. There is no evidence that the newly-born baby sees color as different from gray. By the age of three months, preferences for any hue over gray appear, but there are no great differences among the degrees of preference for the various hues. By the age of eight months there is a marked preference for red, which is held throughout infancy and early childhood. During the grade-school age blue becomes preferred over red, and this preference carries over into adulthood. From one and one-half years of age through to adulthood the preference for yellow declines.

In considering all results cited on color preferences remember that the conclusions apply to the particular blues, yellows, etc., used in the experiment and not necessarily to all blues, yellows, etc., regardless of brightness and saturation.<sup>3</sup>

Primitive peoples and children are in general fond of highly saturated colors; adults and more sophisticated people prefer the pastel shades (or shades of low saturation and high brightness), and blacks, whites, and grays.

The color preferences of adults are difficult to study, because grown-ups refuse to state their preferences in the abstract. Color preferences are conditioned differently for different objects. A man might like rose as a color for his wife's evening gown; yet he would refuse to wear a rose-colored topcoat. Gray may be fine for battleships, white for hospitals, or purple for a king's robes, but you want your spinach to be green.

College students who have been trained in art have the same color preferences as those who have not had formal training, investigations have shown.<sup>4</sup>

B. Racial differences in color preference. Garth and his students studied the color preferences of about 1000 each of white, Negro, Filipino, American Indian, Japanese, Mexican, and East Indian children.<sup>5, 6</sup> He found that very young children of all nationalities agree pretty well in ranking red, green, blue, yellow, orange, violet, and white in that order of preference. The preference of the white children was less marked than that of the colored children. Older children showed decided preferences according to their nationality group. These differences are probably to be attributed to differences in culture.

c. Regional differences. Within the United States there are regional differences in color preferences. For example, the natives of Pennsylvania, probably because of religious influences, are not given to the use of color. Buildings tend to be conservative whites, blacks, and grays. In Southern California, on the other hand, brilliant colors are found in the decorations of buildings and in the building materials themselves.

Color harmony. The matter of pleasantness and unpleasantness of colors cannot be dealt with completely by considering merely the human reactions to any color in isolation. In almost all objects that we see, there are combinations of color. Through combining colors we can obtain interesting effects which cannot be had with the use of uniform hue. Certain hues combine with others to give a pleasing effect; others when seen together are decidedly unpleasant. There are two simple rules which govern most cases of color combination, but there can be exceptions due to certain other causes under very special circumstances. The first rule for harmonious combination is that complementary colors or ones which are nearly complementary give pleasing combinations.<sup>7</sup> In other words, hues which stand opposite each other on the color wheel are pleasing combinations. Let us take some examples. Blue and yellow are very popular colors for a college pennant. Blue and orange and blue and gold are also very attractive. Purple and green, although infrequently seen, are essentially pleasant when used together. Red chair covers and orange curtains, on the other hand, clash. These two colors lie near each other on the color wheel. The second rule of harmony in color brings in the factor of saturation. When two colors of high saturation which clash are reduced in saturation, they lose their unpleasantness and may even become pleasant. Certain combinations of pastel shades are tolerated or even liked, whereas the same combination in saturated colors would be decidedly unpleasant.

It is quite possible to combine three colors effectively (even in dress design), but they must be chosen according to a rule. Not all combinations of three colors will go well together. The rule for color triads or harmonies of three colors is simply stated by reference to the color wheel. To go well together, three colors must be chosen from points which are equidistant on the color wheel.

Violet, orange, and blue-green go well together. Blue, red, and green also form a harmonious triad.

The choice of colors for women's clothes presents some special problems not found in selecting colors for interior decoration schemes or other purposes. Complexion and color of hair must be considered in selecting combinations of colors in clothing. You will remember that contrast effects exist between hues. Looking at yellow, for example, will increase the perceived saturation of blue. Looking at black will increase the perceived brightness of white. Women with sallow skin can use black more effectively than white, since black makes the skin appear to be whiter, which is regarded as desirable among Americans and Europeans. White would bring out the sallow color of the skin. The woman of decidedly fair complexion will look ghost-like in black unless rouge is freely used.

The rules of color harmony which have just been cited have to be applied with restraint and with respect for convention. Custom has it that certain colors are "right" for certain things. To violate custom would result in a displeasing effect, even though the hues employed would in the abstract represent a pleasing combination. Conventions in colors change, but the particular convention of the moment must be considered in selecting colors.

*How color influences behavior.* Color can be very influential in determining people's behavior. There are cases on record in which changing the color of the package or wrapper of a commercial product has increased the sales of the product by as much as 1000 per cent. Although the use of color in advertising is expensive, experience has shown that the added expense is likely to be justified by increases in the effectiveness of the colored advertisement over the black and white one.

In one experiment<sup>8</sup> with direct-mail sales letters in which different colors of paper and envelopes were used, it was found that 18 per cent of the recipients replied to a letter on white paper with a white return envelope; that when pink paper and a blue envelope were used, 48 per cent of the addressees replied.

Red objects seem to be nearer to the observer than blue objects of the same physical size. The lens of the eye bulges more in bringing red and other longer wave lengths into focus than it does in

the case of blue and the shorter wave lengths. The sensations produced by this bulging of the lens have, through years of experience, come to mean closeness, since such bulging always occurs when we look at objects near to us.

Red objects seem warmer and more cheerful than blue objects. This may be due to the association of red and yellow colors with the heat of the flame. Red colors are more likely to suggest gay and cheerful moods than are blue colors. This fact is reflected in our popular language when we use the word "blues" to mean mild depression or boredom. Although many theories of the relationship between color and mood have been suggested, scientific evidence for their validity is lacking.<sup>9</sup> In fact, the cheer-suggesting effect of red as compared with the gloom-suggesting effect of blue is about the only relationship between color and mood that is constant enough to be worth remembering.

Colors differ in apparent weight. The darker colors appear heavier than the lighter ones. This fact must be considered in various phases of designing. A picture or design may appear top-heavy if the apparently heavier colors are used at the top. This does not occur, of course, in an ordinary landscape where the sky is blue and the earth is black or dark.

Objects of the same size will appear larger or smaller depending upon their color. Light objects seem larger than dark objects of the same size. A woman who is sensitive about her big feet would do well to avoid white shoes.

### *How we judge space by means of our sense of sight*

One of man's most important adjustments to his physical environment involves the correct perception of the relationship of physical objects to each other in space. Most occupations and sports depend heavily upon the perception of space through the sense of sight. Surveyors use instruments to overcome the physical limitations of man's sense organs. In golf, baseball, aviation, navigation, and the like, however, the naked eye unaided by mechanical devices must at times be relied upon. How can the human eye, which contains a curved, two-dimensioned surface sensitive to light, actually perceive a world of three dimensions? How do our perceptions of the third dimension of depth arise? The short

answer to this question is that depth is inferred from other more primitive data. But the manner in which this is done is, as we shall see, as complicated as it is wonderful.

*The eye and camera compared.* Before we can go further, we must have a working knowledge of the human eye. The human eye is essentially like a camera. Study the pictures in Figure 26, which show cross-sections of a simple camera and a human eye with the corresponding parts indicated. Notice the following points especially: (1) both have a sensitive surface upon which an inverted picture of the outer world is projected—in the camera this is the film; in the eye, the retina; (2) both have a lens for focusing the rays of light on the sensitive surface; (3) both are provided with an adjustable opening to regulate the amount of light allowed to enter—in the case of the eye we call the opening the iris. The eye has in addition an auxiliary device for controlling the direction in which it is “pointed” and held in place. The eye is controlled by three pairs of muscles, which work together to direct it toward any point in the visual field and to hold it there. These muscles possess tiny sense organs which are stimulated when the muscles contract. For every position of the eyes there is a corresponding pattern of muscle stimuli which tells us how far the eye has moved and where it is at a given moment. Ordinarily the perception of space involves a complex pattern of eye muscle stimulation, stimulation of the muscles of the body involved in turning the head, as well as the nature of the image on the retina itself. All these contribute to the fund of raw data which perception organizes into a meaningful whole.

*How a one-eyed person sees depth and distance.* The person having only one eye, or the person with one eye shut, perceives depth only fairly well as compared with the person using two eyes. This is because the person with one eye has but one retinal image. That is to say, when the outer world is projected onto the two-dimensional surface of his retina, three dimensions are reduced to two, just as the camera reduces three dimensions to two. Thus a long horizontal line will stimulate a series of points on the retina of the observer, while a vertical line in the outer world will stimulate a vertically ordered series of points on the retina. There is no dimension of the retina left to picture directly

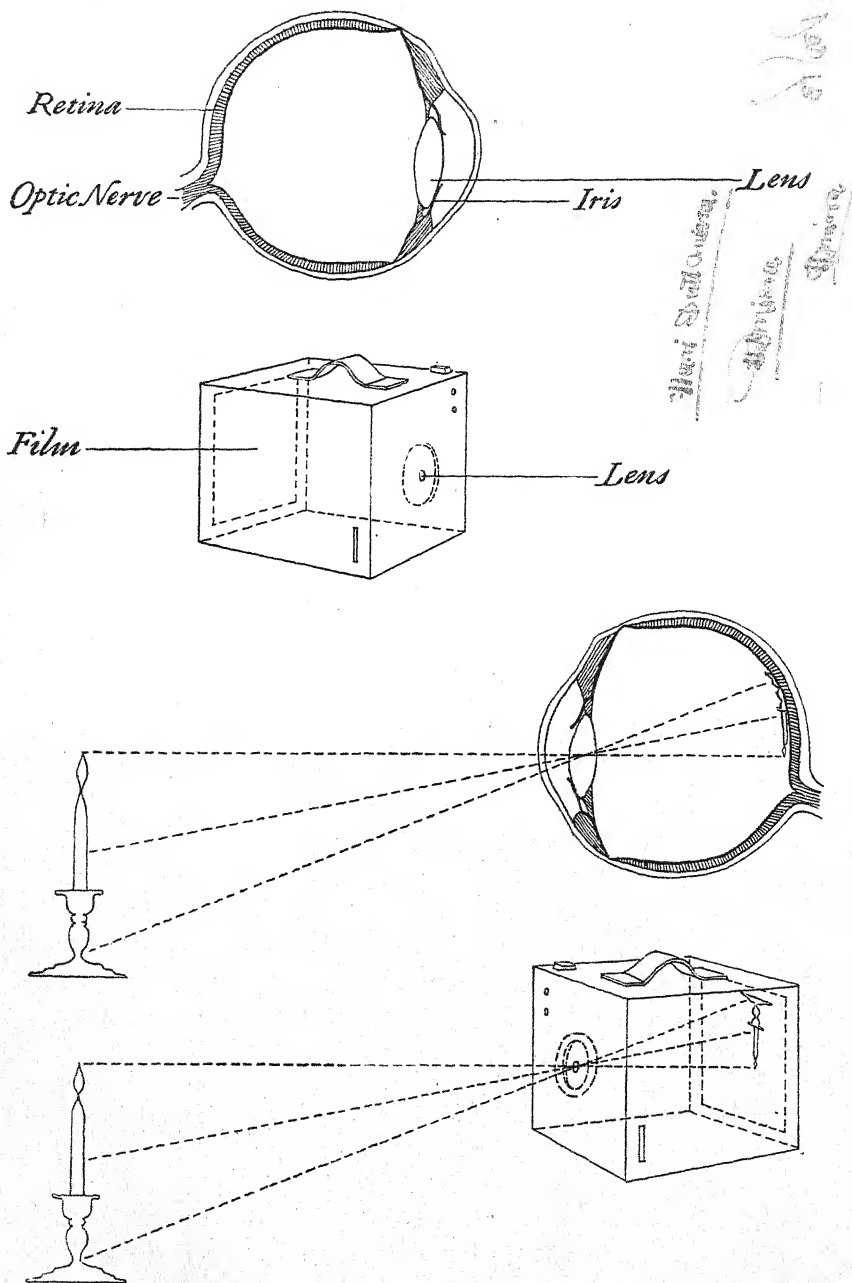


FIGURE 26. *The human eye and the camera have much in common. (See p. 221.)*

the third dimension in space. However, depth and distance can be seen by the one-eyed person in various ways.

A. Accommodation. The lens of the eye bulges out as we look at close objects and flattens when we look into the distance. The shape of the eyeball probably changes also. As a result of these changes, the image is kept in focus on the retina. Each degree of bulge of lens and eyeball gives rise to its characteristic pattern of stimulation, and hence we come to know the distance or depth of an object through those cues. We have been using these cues so long that their use has become unconscious and automatic. We see without thinking about it just as we walk automatically.

B. Distinctness. Because of dust and smoke in the air, objects which are a long way off appear to be blurred and indistinct in outline. Even details which we know to be there are not observable. The extent of this dimming depends upon the distance. We learn to interpret distance in these terms. When the characteristic condition of the air changes, we are thrown off. To the person reared in a smoky industrial city of the East, the distance of objects seen through the clear mountain air of the Far West is greatly underestimated. The tenderfoot at the dude ranch frequently amuses the old hands by announcing that he will ride to a certain hill and back before breakfast, only to learn that the hill is in reality a mountain some forty miles distant. This phenomenon is sometimes called *atmospheric perspective*.

C. Light and shadow. When light strikes an irregular surface, as, for example, the human face, certain parts are brightly illuminated, and others are in shadow. The appearance of these shadows tells us much about the depth of the parts concerned. The artist uses shading and highlights to convey the notion of depth on a canvas of but two dimensions.

D. Relative position. When two objects are in the same line of vision, the nearer one conceals all or part of the farther. Near objects in the outer world usually appear at the bottom of the two-dimensional field of vision, distant objects, at the top.

E. Relative motion. When you look from a rapidly moving automobile, near objects seem to pass by more rapidly than those at a moderate distance, while those very far away actually seem to be going with you. Hold a finger at a distance of one or two



feet from you and look at it intently. Then, without changing your fixation, move your head. Which way do objects beyond your finger seem to move? Now look at the distant wall and move your head. Which way does the near object seem to move? For the one-eyed person or for the normal person with one eye shut, this relative rate of motion is the most important single source of information about the depth and distance relationships of the outer visual world.

F. Known standards. We soon learn that men are about sixty-eight inches tall. Once we are familiar with the height of a particular man, he seems to be about so high, regardless of whether we are looking at him from a distance of a few feet or whether we look at him a hundred yards away. The size of the retinal image is interpreted in relation to the known distance. If the size of the retinal image representing a man is small, the man is seen as far away; if the retinal picture is large, the man is seen as close. The converse of this can be illustrated very simply. Gaze intently at a colored square of paper. As soon as you feel that you have a good after-sensation, turn your gaze on a flat surface several feet farther away. The image will now seem larger. Remember that the size of the retinal image does not change as we alter the distance at which our gaze is directed. Its perceived size changes through interpretation. This interpretation is automatic in the adult, but it is often lacking in the child. A small child will call a man seen in the distance a boy. Look at Figure 27. Cover the hand and look at the fish. Then cover the man and notice how much smaller the fish appears. This is another example of interpretation in terms of a standard.

Relative motion is interpreted in terms of known standards based on our past experience. An individual who had traveled a great deal in small airplanes and had, in fact, flown them was taking his first trip in a large transcontinental transport plane. He asked the captain what the altitude of the ship was, after making his own estimate. His estimate was three thousand feet, whereas the actual altitude was five thousand. The reason for this error is well-known. The higher a plane is above the earth's surface, the slower it seems to be going. A transport cruises at about 180 miles an hour. The individual was in the habit of

flying in a light "cub" at around 70 miles per hour and at a lower altitude than 5000 feet. The apparent speed of the earth to the rear is a strong factor in influencing our estimate of altitude. A forward speed of 180 miles per hour at 5000 feet gives about the same visual cues as a speed of 70 miles per hour at two or three thousand feet. The passenger, forgetting for a moment the greater speed of the transport, judged altitude in terms of the standards built up on his experience in slower-moving airplanes.

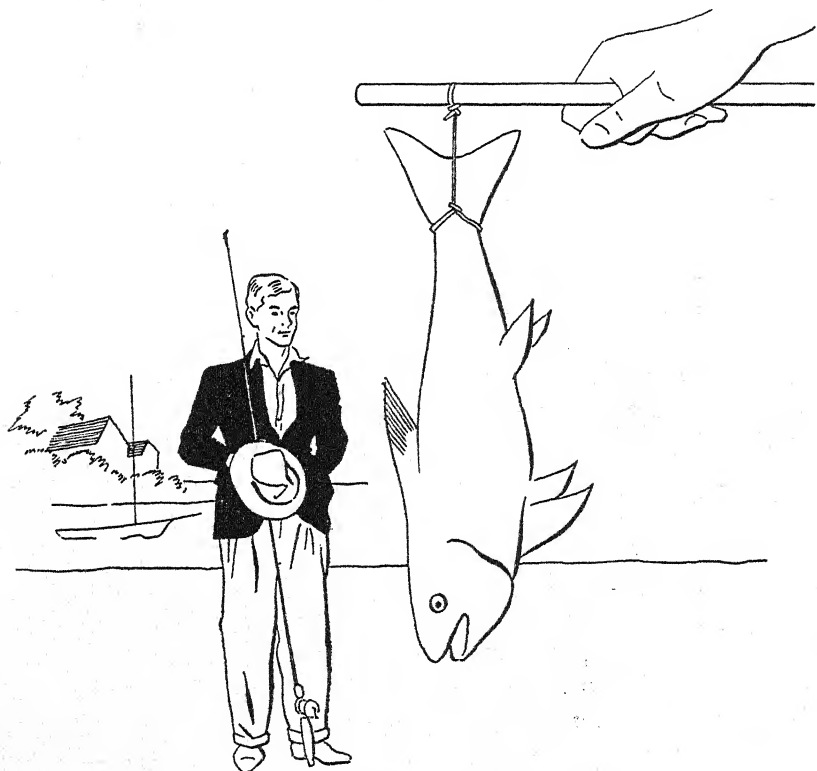


FIGURE 27. *Man-eating fish or fish-eating man? First cover the man, then cover the hand, and the INFLUENCE OF KNOWN STANDARDS becomes apparent.*

*How a two-eyed person sees depth and distance.* The normal two-eyed person has at his disposal all the cues for perceiving depth which the one-eyed person uses, but the superiority of the normal binocular (two-eyed) vision is based on two other cues even

more fundamental and important, which occur only in the normal person with two functionally sound eyes.

A. Convergence of the eyes. With both eyes open, hold the tip of one finger as far away from you as you can. Then look at it steadily as you bring it closer and closer to your eyes until it fairly touches your nose. Observe how the sensation of strain of the eye muscles increases as the finger comes closer. This cue is not available to the one-eyed person in the same degree, as you can see by repeating the above experiment with one eye closed. Unfortunately, the two eyes become for all practical purposes parallel when looking at objects thirty feet or more away, and convergence has little value beyond that point as a basis for perceiving depth.

B. Differences in retinal pictures. Hold your left hand over your left eye and study carefully the view of a book or some other solid object close by. Now, without changing the position of your hand, head, or eyes, shut off the vision in your right eye and notice the difference in the retinal picture. With the right eye you see more of the right side of the object, with the left eye, more of the left side. This is a normal condition of vision, and we have learned to interpret distance from an automatic and unconscious comparison of the two slightly different retinal images.

The stereoscope, which was found in every front parlor a generation ago, is a commercial application of this principle. This apparatus is simply a device whereby the two eyes see two different pictures. The pictures used are taken by cameras mounted slightly apart from each other, just as our eyes are mounted in our heads a slight distance apart. By increasing the distance between the two cameras it is possible to increase the illusion of depth up to a certain point. When the two views become very different, they no longer merge in perception but are seen alternately by first one eye and then the other.

There is now on the market a color-slide projector using this principle to produce the illusory perception of three dimensions on a screen. This machine (really two separate projectors set side by side) projects two slides at the same time, the images being superimposed on the screen. In front of each lens is a filter made of Polaroid, a substance that passes light rays vibrating in one

plane while blocking those vibrating in a plane at right angles to this. The filters are adjusted so that each of the color slides is projected by light rays vibrating in a plane at right angles to the other. The spectator wears glasses with a Polaroid filter for each eye, adjusted to correspond to the filters on the projector. Hence, the left eye sees only that part of the projected double image that was taken by the left-hand camera, the rays of the other part being blocked by the Polaroid filter in front of that eye. Likewise, the right eye sees only that part of the image that was taken by the right-hand camera. The result is an illusion of depth.

*Eye movements.* The distance range of human vision extends far beyond the distance between the two points farthest apart which can be projected on to the eye at one time. The eye makes two kinds of movements—jump movements and sweep movements. In dealing with fixed points and with lines, careful photographs reveal the eye makes a series of jumps. The eyes jump, then stop, then jump again. Exploration of distance by an eye movement is nearly equivalent to pacing the distance with measured strides. Just as we can tell the length of a room by pacing it off, so can we tell the distance between any two visible points by “pacing it off with the eye.” It is this type of movement that the eyes make in reading.

In following *moving* objects the eye glides or sweeps. There is one general rule of clear vision which operates both in reading and in following moving objects. The eye sees best when the image falls on dead center. The eyes must move in unison with a moving object to retain this condition.

The sweep movements of the eyes are easier in the horizontal plane than in the vertical. This again is very well, because we are called upon to dodge more automobiles coming from the side than airplanes coming from above. An interesting indication of the greater ease of side-to-side as compared with up-and-down eye movements is seen in the results of tests of young babies. One psychologist determined the age at which following movements of the eyes appeared in average children.<sup>10</sup> Figure 8 on the following page gives a tabulation of her results:

It is quite clear that the side-to-side movements are more “natural” in the sense that they are perfected earlier in life. There

is an optical illusion which may be the result of the greater difficulty of the up-and-down as compared with the side-to-side move-

TABLE 8: *Average Age at Which Eye Movements First Occur in Infants*

TYPE OF EYE MOVEMENT	AVERAGE AGE (IN DAYS) AT FIRST OCCURRENCE	NUMBER OF CASES
Side-to-side	58	312
Up-and-down	65	283
Round-and-round	78	272

ments. Look at the cross in Figure 28. Which line is longer? Now take a bit of paper or a ruler and measure them. Were you right?

*What makes the movies move?* The motion picture was at one time hailed as a marvel of modern science. Now we are so accustomed to it that we rarely speculate on this interesting phenomenon. The motion-picture film is simply a series of still pictures flashed on a screen one after the other at the rate of fifteen to twenty-five per second. The pictures of the original scene are taken at about the same rate. How then can we see a series of still pictures as smooth, continuous motion? Why do the movies not jump? Why is the seen motion so perfect and realistic?

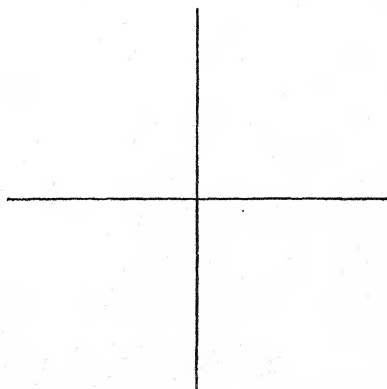


FIGURE 28. *Lines may lie. Which line is longer? Rotate the page 90 degrees and see whether you still think so.*

Movement is simply change of the position of an object in space. When the object is perceived first in one position, then in

another, etc., it is perceived as in motion if the second position follows quickly enough and is not too far removed. It is not necessary for the object to be perceived in all of the intermediate positions in order that it be seen as moving. In fact, the eyes never follow a moving object with sufficient precision to keep that object in full view at all times. Normal perception is an act of filling in the blanks. In the motion picture, as in life, objects are seen in successive positions in space. When the gaps between are not too great and when the successive positions are perceived rapidly enough, the perception of continuous movement takes place. The motion-picture film is no more wonderful than ordinary visual perception. It is merely an application of a fundamental fact about the visual perception of motion.

The motion-picture camera can be used to "speed up" some action to make it more easily studied. For example, action may be speeded up by taking not twenty-five pictures per second but some smaller number. When these pictures are then shown at the standard speed, the action progresses much more rapidly. Thus you can see a flower break into bloom before your very eyes and within a few seconds of time. The rapid action of an athletic contest may be "slowed down" by taking more than twenty-five pictures per second and showing them at the standard rate. This method of slow-motion pictures is used by athletic coaches to observe and point out to players the good and bad points in their performance and by industrial efficiency experts to study the least time-consuming motions involved in the performance of a standard factory task.

### *Form and beauty*

Ever since psychology broke away from philosophy, the psychologists have attempted to find general principles which will explain why we see some forms as beautiful and others not. To date these principles are few, and each has important exceptions. There are, however, a few fundamental observations which have fairly general application to individuals reared in European culture. They are by no means universal. Our tastes in beauty are highly dependent on our culture. Since culture changes, it is difficult to find unchanging laws of beauty.

*Proportion.* Certain shapes seem to be preferred over others by most people. People are rather generally agreed that the square is not a very attractive shape for a book page, a picture frame, or an envelope. A rectangle is preferred to a square, but the rectangle cannot be too long and lean. The formula which expresses the proportion of length to width of the most pleasing rectangle is as follows: width is to length as length is to width plus length. This is the "golden section" of the Greeks.

*Balance.* When asked to divide an area into two parts, most people will draw the dividing line in such a way as to leave equal areas on the two sides. In similar fashion a simple straight line will be divided near its middle and not toward either end. In other words, a geometrical pattern must be balanced. Otherwise, the effect is unpleasant. See Figure 29.

The idea of balance is part of the feeling which psychologists call *empathy*. Empathy is the tendency of a person to feel in himself the strains perceived in the external situation. The observer identifies himself with the objects in the picture or scene. Look at Figure 30a. If the column is too strong for the weight of the capital, we have a feeling of the waste of power. Our feelings of empathy in architecture are greatly influenced by our knowledge of materials and their properties. A steel bridge does not seem

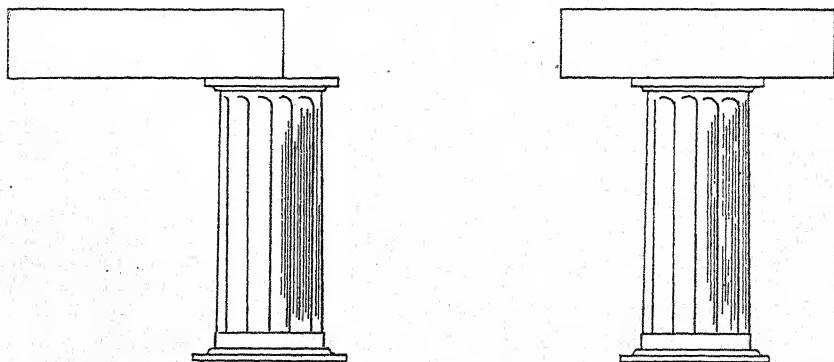


FIGURE 29. Buildings, like budgets, we usually feel should be balanced.

spidery and inadequate, because we know that steel possesses tremendous strength. If we see Figure 30b as a huge capital supported by a slender pillar, we feel strain as though we were called upon



to help support the too heavy load. If, on the other hand, we see it as a parade banner, we feel no such strain.

*Rhythm.* When people are asked to complete an unfinished geometric design, they almost invariably "balance it out" by

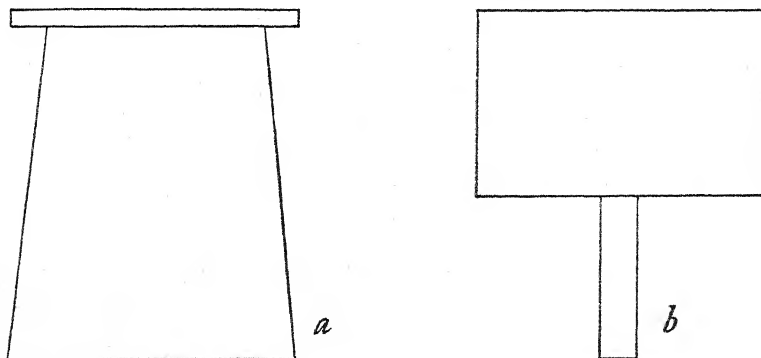


FIGURE 30. *Projecting ourselves into these elements seen as parts of buildings, we are uncomfortable. We feel waste or strain.*

drawing a part which is symmetrical with the part which has been given. In looking at a building or design we are pleased when there is some essential rhythm running through the whole. The rhythm should not, however, be too regular. A building which is completely symmetrical may be dull as compared with one which departs slightly from a fundamental symmetry.

### *Hearing and Living*

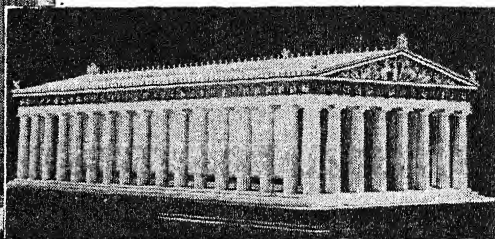
Although hearing is less important in effective living than vision, it is still an asset of great value.

#### *The physical basis of sound*

Sounds are produced when air which has been caused to vibrate in a rhythmical fashion reaches the ear mechanism. Just how the ear analyzes the sound wave is still somewhat of a mystery, although it has been extensively studied because of its practical significance in relation to such problems as telephone and radio-phone and also because of the hope that once the physical mechanism of hearing is well understood, it will be possible to cure or alleviate deafness more successfully than we now can.



FIGURE 31. Which of these two structures is "more beautiful"? Both classical and modern forms of architecture have proportion, balance, rhythm, although in the last element in particular, liberties may be taken now. Note, for example, the horizontal lines, the flat surfaces, the blending-with-the-landscape qualities of a house by Frank Lloyd Wright. Note, too, the attempt to fit the house to the individual and a modern way of life. And so we get into questions of form and function. And endless debate.



Pitch and intensity. Psychologically there are two fundamental unanalyzable elements in sound sensations, *pitch* and *loudness*. (a) If you pluck the strings of a musical instrument, they will start to vibrate. As a string vibrates (moves back and forth), it causes the air to move back and forth in a similar fashion. The ear interprets these waves as sound. Waves of slow vibration are interpreted as *tones* of low pitch. Faster vibrations are the stimuli to tones of higher pitch. The speed or frequency with which the string vibrates depends upon its diameter, length, tension, and the material of which it is composed, but not upon the force with which it is plucked. (b) The harder the string is plucked, the wider the swing of the vibrations produced in the surrounding air and the louder the tone.

Pitch, then, depends upon the frequency of the sound wave; loudness depends, when pitch is constant, upon the amplitude of the vibration.

Noise, overtones, and timbre. The stimuli to the other aspects of sounds are to be understood in terms of the mechanisms underlying pitch and intensity.

(a) *Noise* is produced when the fundamental pitch of the sound wave is complicated by irregular disturbances in the air striking the ear. Throw a piece of wood on the floor, then on a table, then on the seat of a chair. Observe that each object produces a different sort of noise. Listen carefully as you repeat this experiment, and you will observe that the noises vary in pitch. Each noise has a fundamental rate of vibration which gives it its essential pitch. The irregular noise components may be so great that one has difficulty in hearing the fundamental note, but accurate analysis will always reveal its presence.

(b) *Overtones* are simply tones which are added to the fundamental tone, since a wire will vibrate as fractions of its length at the same time that it is vibrating as a whole. That is to say, a wire four feet long will vibrate as a four-foot wire, and at the same time it will vibrate as two two-foot wires, and to a much less extent as four one-foot wires. These *partials*, as they are sometimes called, are included in the whole sensation.

(c) The nature and relative strength of the overtones and noise in a sound determine the *timbre*, or quality, of that sound. Musical instruments vary in the number and loudness of overtones produced and consequently in the timbre of their tones, even when producing notes of the same pitch. The notes of the organ have many overtones, and its tone is correspondingly full and rich, while that of the trumpet is raspingly hard, because of a scarcity of overtones. The tones produced by two different players on the same instrument will frequently vary in timbre. This is especially true on an instrument such as the violin, where the slightest difference in the fingering or use of the bow will cause a variation in the sound produced.

### *Sound elements in the human voice*

Human speech is complex. It contains both tones and noises.

*How speech sounds are made.* The tonal element is furnished in human speech by the vocal cords. The vocal cords are folds of membrane which stretch across the windpipe at the Adam's apple. As air rushes out of the lungs, it sets these cords into vibration to produce high- or low-pitched tones, depending upon the degree to which they are under tension at the moment. The tones thus produced are modified by the passage of the air through

the various cavities of throat and head. Further modifications are made possible by the addition of the explosive noises produced when air is suddenly allowed to escape from the mouth and by the fricative noises produced by the hissing of the air over the tongue and teeth. The letters *s* and *z* are examples of fricative sound, while *b* and *p* illustrate the explosive type.

Speaking a language consists in making combinations of sounds having specific meanings to all members of the given society.

*Voice quality.* Human voices vary from individual to individual and from time to time in the same person. We label the voices of others as crude or cultured, as pleasant or unpleasant. We are even justified in classifying voices as intelligent or stupid.<sup>11</sup> People's voices, like musical instruments, vary in timbre. Some voices are full and mellow, others thin and rasping; still others are characterized by a nasal twang.

### *Deafness*

We pity the blind man, yet there are many pleasures which he can enjoy. The blind are not cut off from the pleasure of listening to music. To them the radio can be a constant companion and never-ending source of enjoyment. The blind may follow the news of the day or enjoy conversation with friends just as easily as their seeing brothers. Let us save some of our sympathy for the person who cannot hear.

Deafness is nearly as much of a handicap in civilized social life as is blindness. The deaf person is more completely cut off from human conversation than is the blind, for conversation with the deaf is usually a slow and laborious process requiring no small measure of patient kindness. Not only does the deaf person fail to hear; he often loses his ability to talk after prolonged deafness. Without the ear to guide the work of the muscles of speech, the ability to speak deteriorates and is eventually lost completely. Fortunately, few people are entirely deaf. Also there are devices which amplify sounds to the extent that they can be heard easily by the hard-of-hearing. Other devices translate sounds into vibrations which can be perceived through the sense of touch.

Although we usually think of deafness simply as inability to hear, there are in reality several kinds of deafness.

*Tone deafness.* Some people are unable to tell one note on the piano from another, or, at least, they are unable to tell which of two tones is higher. Tone deafness, of course, is not an all-or-none condition. People vary in sensitiveness to differences in pitch. Tone-deaf persons can never become good musicians. It goes without saying, of course, that the mere ability to discriminate tones with a high degree of accuracy does not ensure one of success in a musical career.

People lacking an "ear" for making tonal discriminations will never excel in speaking foreign languages.

*Intensity deafness.* Many people are "hard of hearing" in the sense that they cannot detect faint sounds easily heard by normal persons. With such persons it is necessary to shout in order that they hear. This type of partial deafness, a serious hindrance in many occupations, is often an occupational disease, as among aviators and boilermakers, for example. The physician whose hearing is poor cannot be expected to diagnose a heart disorder accurately on the basis of a stethoscopic examination. Curiously enough, statistics show that the hard-of-hearing are safer automobile drivers than those of normal hearing, probably because they realize their handicap and are more careful.

### *How we perceive space through hearing*

In crossing a busy intersection, as in many other daily activities, much depends upon our accuracy to tell from which direction a sound is coming.

*How we perceive the direction of a sound.* Our ability to localize sounds is almost entirely dependent upon the fact that we have two ears located at different points in space. A given sound affects the two ears differently in three respects. (See Figure 32.)

(a) The sound coming from a pitch pipe at the left of the head strikes the left ear before the right. This difference in time can be very short, but it serves to tell us from which side the sound is coming. (b) Notice also that the sound wave coming from the left stimulates the left ear more strongly than it does the right, because the head absorbs some of the sound energy and because the right ear is farther away. (c) As you remember from your physics or general science course, sound waves consist of areas of high and low pres-

sure in the air. Since the two ears are at different points in space, the sound wave will be in different phases as it stimulates the two ears. Sound waves travel very slowly as compared with light waves, with the result that in the case of sound waves differences in phase

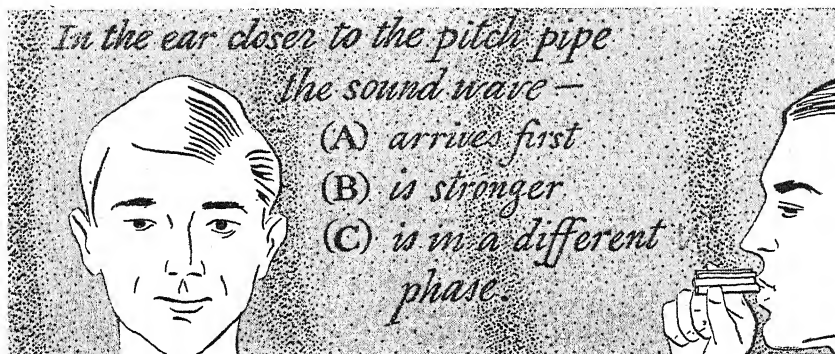


FIGURE 32. A sound source stimulates the two ears differently, and we are thus enabled to sense the direction—of a fly or a dive-bomber.

are appreciable. Sounds directly in front of us cannot be distinguished from those directly above or behind us because the two ears are stimulated similarly by them.

The essential principle of the human ear has been reproduced in various types of equipment for accurate auditory observation of direction of sounding objects. If, instead of listening with the naked ear, we employ two sensitive microphones set apart at a distance much greater than that of the human ears and let one microphone activate a receiver at one ear and the other microphone connect with a receiver at the other ear, we can greatly increase the accuracy of our auditory perceptions of space. Instruments of this kind are actually used in listening for approaching airplanes, distant guns, etc. Once the direction of the object has been established by turning the microphones until each sound comes in with equal intensity, the angle of the object above the earth can be determined in similar fashion by placing one "ear" above the other. Military experts have now worked out a mechanism employing this principle which automatically "finds" airplanes, points the anti-aircraft guns at them, and fires. Similar devices are used in ships for locating the depth and direction of a submarine, in order to be warned against attack and to be guided in escape. Here the microphones are set below the water line at

various parts of the ship. The microphone nearest the concealed submarine activates its receiver the most vigorously, thus pointing to the submarine.

*How we perceive the distance of a sound.* There are two ways in which we can tell how far a familiar sound is from us. (a) The farther away a sound is, the weaker it will be. The ear-splitting locomotive whistle heard in the station becomes fainter and fainter as the train moves into the distance. (b) The sound of familiar objects changes in timbre as their distance from us increases. The farther away the sound is, the purer it is. The tinny jangle of the cheap phonograph gives way to mellow music when heard in the distance, as from across a lake. This increase in purity of the tones produced results from the loss of the irregular sound waves which are noise and from the loss of the shrill overtones, which lack sufficient energy to carry very far.

### *Beauty as heard*

We "hear" beauty in both music and poetry. In both these art forms various elements are involved.

*Music.* In music the two factors contributing to our enjoyment are tone and rhythm. In a general way, tones are pleasant; noises, unpleasant. But a single tone in isolation is only moderately pleasant. No tone, presented alone, seems to be more or less pleasing than any other tone presented singly. If tones are presented in combinations, however, wide differences in pleasantness are observed. The various chords or tonal combinations which lie within one octave fall in the following order from most to least pleasant: (1) Major third; (2) Minor third; (3) Octave; (4) Major sixth; (5) Minor sixth; (6) Fourth; (7) Tritone; (8) Fifth; (9) Major second; (10) Minor seventh; (11) Major seventh; and (12) Minor second.<sup>12</sup> This order represents the pooled judgments of a large number of subjects. Individuals differ widely in their preferences for chords.

There is good reason to believe that modern man requires more intricate musical combinations than were considered by the ancients to be pleasant and satisfying. Conversely, the intricacies of a Debussy would have been so far from the understanding of the Greeks as to be voted downright unpleasant. Indeed the combinations of Debussy which so please the sophisticated modern



were regarded only a generation ago as unpleasant and dissonant. Chords which are too simple soon become uninteresting to us; too complex chords annoy us because we cannot understand them.

Culture greatly influences preferences in music. Jewish and other Oriental music contains far more minors than our music.

Just as increasing the intensity of two colors that clash increases the unpleasantness of the combination, so does increasing the intensity of two dissonant sounds increase their unpleasantness.

Although tone-deaf people can never enjoy music to its fullest, it would be going too far to claim that such people are entirely incapable of enjoying music, for there is more in music than tone. Rhythm is an important element in music and may give pleasure even to one who cannot tell one note from another. Rhythm and harmony of tone are both important to music, but the abilities to perceive them are not always found together. Many a drummer is below average in ability to discriminate tones.

In the field of rhythm also we see definite signs of changes in preferences with the passing of time. The simple regular rhythms of a few generations ago are being supplanted by the complicated syncopations of the swing band.

Some individuals seem to prefer fast tempos in rhythm, while others prefer slower ones. There has been much speculation as to whether such preferences are "innate" or acquired as a result of cultural influences. The evidence on this point is not yet conclusive. Cultural effects are certainly important; they may be all-important in determining preferences.

Foley has attempted to discover how these differences come about.<sup>13</sup> Traditional theories of aesthetics have been classified into "stimulus" theories, considering aesthetic preferences to be due to characteristics inherent in the stimulating object, and "response" theories, which explain aesthetic behavior in terms of the various inherent characteristics of the response. Foley believes that general principles of aesthetic behavior cannot be stated exclusively in terms of either. He feels that general principles must be formulated in terms of the past experience of the subjects concerned, i.e., in terms of their conditioned reactions to stimulus objects and events. His subjects were 684 girls aged 13 to 20 who were then students in a trade school. They were taken from the following courses: Machine Sewing, Hand Sewing, Beauty Culture, Com-

mercial Typewriting, Domestic Occupations (waitress training, nursery education, etc.). The groups were roughly comparable in chronological, educational, socio-economic, and general intellectual status; they differed only in the particular vocational training and hence in the particular stimulatory factors involved in each specific type of training. Since there are characteristic auditory stimuli continuously present in each type of training, there would be inevitable conditioning to them. Foley was interested, accordingly, in seeing whether the preferences for one tempo over another which the girls exhibited correlated positively with the types of training they were undergoing and hence with the particular auditory stimuli they were subject to.

The apparatus used to produce the various auditory tempos in the experiment was a standard metronome, adjustable to speeds of 40 to 208 beats per minute. The subject was given a series of different speeds of beat rates and was asked to indicate in each case whether she liked that particular speed or not. Six representative speeds were presented serially in an ascending order and then in

TABLE 9: *Auditory Tempos Preferred by Different Occupational Groups*

OCCUPATIONAL GROUP	TEMPO PREFERRED	NO. OF SUBJECTS
Commercial typists	178.08	182
Power-machine operators	161.02	90
Beauty culturists	139.04	165
Trade dressmakers	134.46	180
Domestics	133.61	67

a descending order. If the same speed was judged positive in both series and all other speeds judged negative, it was taken as the preferential rate or tempo. If two or more positive responses were obtained, these particular speeds were repeated until the preferential response had become stable with respect to a single speed.

In musical terminology it may be said that these last three groups on the average preferred an *andante* tempo; the Power-Machine Operating group preferred a relatively slow *allegro*; the Commercial Typewriting group, a fast *allegro* bordering on *presto*.

These inter-occupational differences in preferred metronome rate are in exact conformity with what would be predicted on the basis of an empirical theory of preferences in auditory tempo—namely, that such preferences are acquired by conditioning.

*Poetry.* The beauty of poetry comes from the judicious integration of sound, meaning, and rhythm.

A. Sound. *Sound* pure and simple is much less important in poetry than many persons imagine. Thorndike found that meaningless sounds do not differ greatly in their pleasantness, while meaningful sounds are voted pleasant or unpleasant depending on whether their meanings are pleasant or unpleasant.

B. Rhythm. *Rhythms* which are too complex are not appreciated. "Mary had a little lamb" of the old nursery rime is preferred by children (and by many adults) to Meredith's "Under yonder beech tree single on the greensward."

C. Meaning. More important than mere sound or rhythm is the idea or story told by the poem—the *meaning*. High-school teachers of English literature have failed to recognize this fact sufficiently. As a rule the poems assigned to high-school students are far beyond their comprehension. Many a child has been permanently prejudiced against great literature by the attempts of the school to force an interest which is beyond his level of maturity.

Irion made an exhaustive investigation of the comprehension of ninth-grade children in their studies of literature.<sup>14</sup> One example will serve to make the point clear. Children were given the assignment of reading Byron's *Destruction of Sennacherib*.

The Assyrian came down like the wolf on the fold,  
And his cohorts were gleaming in purple and gold;  
And the sheen of their spears was like stars on the sea,  
When the blue wave rolls nightly on deep Galilee.

Like the leaves of the forest when Summer is green,  
That host with their banners at sunset were seen:  
Like the leaves of the forest when Autumn hath blown,  
That host on the morrow lay withered and strown.

For the Angel of Death spread his wings on the blast,  
And breathed in the face of the foe as he passed;  
And the eyes of the sleepers waxed deadly and chill,  
And their hearts but once heaved, and forever grew still!

And there lay the steed with his nostril all wide,  
And through it there rolled not the breath of his pride;  
And the foam of his gasping lay white on the turf,  
And cold as the spray of the rock-beating surf.

And there lay the rider distorted and pale,  
With the dew on his brow, and the rust on his mail:  
And the tents were all silent—the banners alone—  
The lances unlifted—the trumpet unblown.

And the widows of Ashur are loud in their wail,  
And the idols are broke in the temple of Baal;  
And the might of the Gentile, unsmote by the sword,  
Hath melted like snow in the glance of the Lord!

The summary of a typical boy of fourteen years follows:

The Assyrians came like wolves by night, crossing the rolling waves of the sea of Galilee. And his weapons were gleaming like purple and gold; and the sharpness of *their* spears was like the sea of stars seen by Galileo.

They wore green uniforms in the evening and the next morning brightly colored like autumn leaves. It was a cowardly army creeping up like a pack of wolves.

The army of Galilee was defeated when the foe swept down on them, and they were shattered and strown when the death trumpet sounded like autumn winds. They met with an unexpectedly strong enemy. The blast, that is, the explosion that followed, caused many deaths and the eyes of the dead awakened and for a minute they were frightened and then their hearts took courage.

And there lay the steed with his mouth wide open, but through it there rolled not the breath of his pride. The foam of his *grasping* lay white on the *surf*, and cold like the spray of the imprisoned criminal beating against the stone walls.

There lay the rider all hacked to pieces with dew on his brow and rust on his *letters*.

Because of previous wars there were many widows, and they were crying aloud for revenge upon the Assyrians. They created such a commotion that the idols were upset in a temple in Palestine. The Assyrians destroyed the idols and the Army of Gallilee melted like snow in the *lance* of the Lord.

After reading this summary of Byron's poem one wonders if it would not have been just as well to have assigned Lewis Carroll's:

'Twas brillig, and the slithy toves  
Did gyre and gimble in the wabe;  
All mimsy were the borogoves,  
And the mome raths outgrabe.

Both are pleasing to the ear, and one is about as meaningful as the other to the high-school freshman.

## *Our Senses of Touch*

ALTHOUGH sight and hearing are man's most important channels of contact with the physical world which surrounds him, he learns much of the external world through his sense of touch. The sense of touch is relied upon heavily by the person who is so unfortunate as to lose the sense of sight. At times, all of us use it to verify the visual impression. We have four types of touch sensation—pressure, pain, cold, and warmth.

### *Pressure*

The ordinary person is likely to think that every point on the tip of his finger, for example, is equally sensitive to pressure. This is because we usually encounter pressure from blunt objects, such as rings, clothing, etc., which cover more than one small area at a time, therefore making it difficult to determine just where the pressure-sensitive areas are. The truth of the matter is that pressure sensitivity exists in tiny spots surrounded by relatively insensitive areas. The richness with which a given portion of the skin is endowed with pressure spots will determine the sensitivity of that region. For example, the sensitive ball of the thumb has about 135 pressure-sensitive spots in each square centimeter of its surface; the back of the hand, 30; and the upper arm, 10. The number of pressure-sensitive spots varies with the strength of the stimulus.<sup>15</sup>

The sense of touch is of great use to individuals who do fine manual work of any sort. Engravers at the Bureau of Printing in Washington use their hands to wipe off ink from the plates used in printing, and can feel accurately just how much to wipe off. The physician relies heavily on touch in making certain examinations.

The blind find in the sense of touch a partial substitute for their lost vision. The blind read by means of the Braille system (so named after its inventor, a Frenchman), which makes use of a series of raised dots to indicate the letters of the alphabet and punctuation marks. The blind person "reads" his book by feeling these dots. In some schools blind children are provided with a kind of punching board by which they can "write" their lessons,

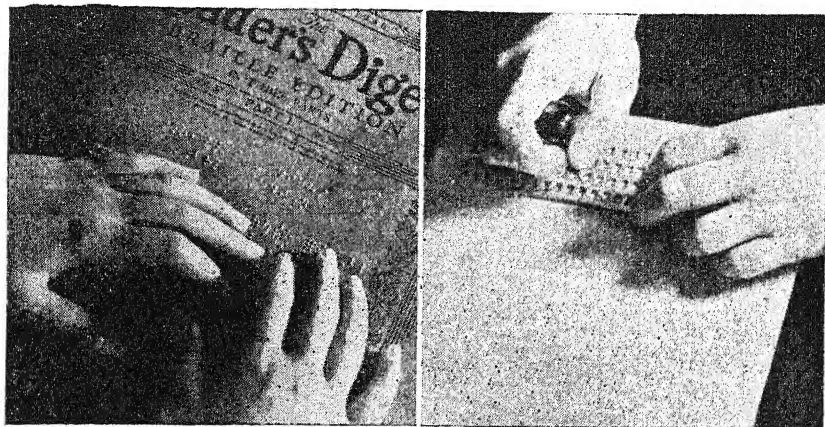


FIGURE 33. *The Biblical statement might here be paraphrased, "They have not eyes, yet they see—through the fingers."*

using the Braille code. The disadvantage of the Braille over printed material is that, the sense of touch being so much coarser than that of vision, the characters must occupy more space. Moreover, the time required for the fingers to explore and interpret a character is long as compared with visual perception.

The pressure sense is decidedly subject to fatigue and adaptation effects. If a gentle pressure is maintained constantly, we soon become unaware of it. For example, our clothing exerts a certain amount of pressure which we ignore. Put on a new pair of shoes, or, better still, a different pair of shoes, and you will become aware of the difference in the pressure pattern.

### *Pain*

Pain sensation may be aroused by intensive stimulation of most of the tissues of the body. Any object or substance which will injure the nerve endings located in the skin or other tissue of the body serves as a stimulus to pain. Pain spots are located by pressing the skin with a fine-pointed needle. Pain, like pressure, warmth, and cold, shows a point distribution rather than a continuous or even one. Pain spots are much more numerous than pressure-sensitive points. The number of pain spots per square centimeter of body surface is about 50 on the sole of the foot; 60 on the ball of the thumb; 170 on the eyelid; 230 on the neck.



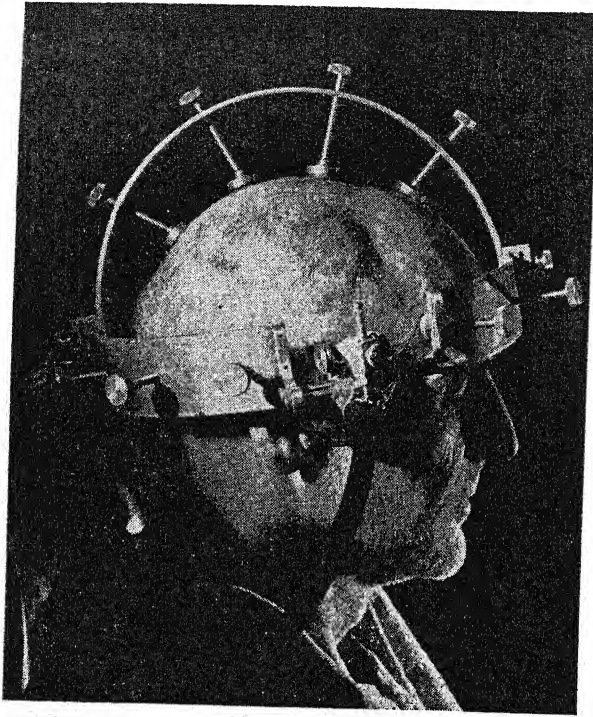


FIGURE 34. Pain is pain from one person to another. Through ingenious arrangements (for instance, the one shown here for measuring arterial pulsations in migraine) scientists at Cornell Medical College (New York Hospital) have shown that individuals do not differ in the degree of pain suffered in a given affliction, according to Life. Presumably one explanation is that people normally have the regular number of pain spots on the body surface and in the tissues of the inside of the body. The tests covered headaches, stomach-aches, pain from heat and cold.

When it is necessary for the physician to draw a few drops of blood, he pricks the ball of the thumb, for that area is relatively insensitive to pain.

The tissues of the inside of the body have few pain spots as compared with the surface exposed to the world. The adaptive significance of this is easily seen. In primitive conditions injuries to the skin served to make the animal avoid the situations in which such injuries were encountered. A sensitive skin was thus a protection. By the time a wound reaches the inside of the body, it is usually too late for a warning of danger to be useful.

Excessively strong stimulation of any sense organ will produce pain. The merciless intensity of the light from an electric arc is actually painful if continued a few seconds. It is well known that excessively hot or cold objects are painful to the skin. Loud sounds hurt the ear. Certain intense smells are also painful. One explanation is that each part of the body surface is supplied with



pain receptors which come into play only when any stimulus is strong enough to bring about actual injury. Thus the pain receptors activated by strong stimuli which would not affect them at lower intensities would serve to protect the organism against danger by giving warning that the stimulus energy was actually destroying the tissues. Usually the pain precedes actual destruction. This is not always so, as anyone who has had a bad case of sunburn will testify. We have no sense organs sensitive to the ultra-violet light of the sun which burns us.

### *Cold, warmth, and heat*

Physically, cold and warmth are simply degrees of the same thing, i.e., amounts of heat; psychologically, they are entirely separate. It is possible to map the warmth-sensitive areas of the body's surface by placing a pointed metal object of suitable temperature here and there on the skin and asking the subject to report when the sensation of warmth is experienced. The cold-sensitive spots may be mapped in a similar fashion. When the same area of the skin is mapped for both warmth- and cold-sensitive spots, we see that the two sets of spots do not coincide.

The number of cold spots varies with the region of the body and the manner in which they are determined. In general, according to the usual method of exploration, there are more cold spots than warm on the same area of the body.

The stimulus to the warm-sensitive spot is the addition of heat, while the loss of heat to a cold object stimulates the cold spot. Objects which are at the same temperature as the skin itself, usually about 90 degrees Fahrenheit, stimulate neither type. Hence this temperature is known as the psychological zero point or point of indifference. This indifference point is not constant, however. Dip your left hand into a pail of water at 80 degrees Fahrenheit and your right into one at 100 degrees for a few minutes. After a short time each hand feels neither warm nor cool. Then plunge them both into a pail of water at the normal indifference point (90 degrees F.); this latter temperature will seem warm to the left hand and cool to the right hand, which was removed from the warmer water. *Sensory adaptation* has taken place.

So far nothing has been said of the quality of *heat*. Heat as a psychological experience is not merely extreme warmth. It is aroused by the simultaneous stimulation of warm and cold spots.

There is a curious phenomenon of the temperature sense which we call *paradoxical cold*. Cold-sensitive spots are normally stimulated by temperatures only below the psychological zero point but may be stimulated by temperatures above it. For example, a cold spot on the skin has a psychological zero point of 90 degrees F. and gives no response to temperatures ranging between this point and about 110 degrees F., but to temperatures above 110 degrees F., it responds with an intense sensation of cold. This we call *paradoxical cold* because the sensation is actually aroused by a warm object. A similar phenomenon of *paradoxical warmth* is obtained when warmth-sensitive spots are stimulated by cold objects ranging in temperature from about 75 degrees to 88 degrees F. These phenomena leave little doubt that sensations of warmth and cold are brought about by separate mechanisms in the nervous system.

Suppose you go into a room on a summer day when the thermometer reads 90 degrees F. There are several objects lying on the table—some crystal beads, a metal letter-opener, a knitted wool necktie. You hold each one of these objects against your perspiring cheek and observe that the beads and metal letter-opener actually seem cold, while the knitted wool tie is warm to the touch. Of course all these objects are at the same temperature. The point is that crystal and metal, especially the former, absorb heat easily, while wool prevents body heat from escaping. Thus we see that the effective stimulus to the temperature senses is the addition or subtraction of heat from the tissue of the receptor.

### *Our Senses of Body Position and Balance*

A STATUE of a man would probably fall over on the floor if it had only the small surface of its feet to balance on. Yet man himself not only stands erect and moves about with only a few square inches of contact with the earth's surface but can, with a great deal of practice, learn to walk on a treacherous wavering wire or the uncertain surface of a floating log. Man's ability to stand up under such conditions is due to his possession of bal-

ancing reactions, which are set off by the stimulation of certain sensory receptors located all over the body.

### *Kinesthesia, or "muscle sense"*

Close your eyes and relax your body. Have someone place your arm in a certain position. Observe that you can report the position of the arm without looking at it. Let your friend move the arm slowly, bending it at the elbow through an arc of two or three degrees. Notice that even so slight an excursion gives rise to definite sensations of movement. The receptors which produce these sensations are located in the muscles, tendons, and joints of the body. When the parts of the body move, these receptors are stimulated by stretch and pressure giving rise to sensations of position.

Much of what we call touch involves some muscle movement sense as well as pressure. The so-called "feeling" of velvet or silk as contrasted with oily glass or again with sandpaper, is composed partly of the muscle sensations produced by different degrees of resistance to movement. This we call active touch.

Our muscle sense also shows adaptation after prolonged stimulation. This fact is the basis of a "stunt" that many of us performed as children. Stand close to a wall and press the arm outward at the level of the hip against the unyielding wall. Maintain this posture and pressure until you commence to feel tired. Then step quickly away from the wall, and you will notice that your arm actually jumps up as though it had no weight. It will seem light even if it does not move upward a few inches. This happens because the receptors in one set of muscles become so fatigued that they fail to send in their normal messages. Consequently the arm, when released, is at the "mercy" of the other set. If you have not tried this recently, you should seize the first opportunity to do so, as it is a good demonstration of sensory adaptation in the field of kinesthesia.

### *Labyrinthine sense*

Imagine that you are lying completely relaxed in some heavy fluid which would support your body in any position without effort or muscular contraction of any sort. Every time your head

changed position, you would know it. The receptors involved in giving you a cue to body position under these circumstances are located in the labyrinth or semicircular canals which are a part of the inner ear but which have nothing whatever to do with hearing. These canals run through the three dimensions of space and are filled with a fluid which presses against their walls as the position of the body is changed in space. The pressure of the fluid is passed on to little hair-like receptors in the walls of the tubes, giving rise to sensations of position.

### *Dizziness*

Ordinarily the labyrinthine sense and the kinesthetic senses coöperate with vision to give the cues to distance and direction in space that are necessary to maintain the balance of the body or awareness of its position. When these various sensory data are conflicting in nature, dizziness or *vertigo* frequently results. For example, people often become dizzy when riding in an airplane in rough weather or when ascending or descending in an elevator which makes a great many stops. Ordinarily we expect the labyrinthine sensations to be accompanied by visual sensations; for example, when we jump, we see our position in space change and also experience labyrinthine and kinesthetic sensations of movement. In the airplane during bumpy weather the visual field remains unchanged while rather sudden changes of position in space cause us to have intense labyrinthine sensations. This lack of coördination often produces dizziness. The elevator supplies a similar situation. The walls of the cage remain stationary with regard to our visual field, but we have strong sensations of falling and ceasing to fall.

You will remember that our labyrinthine sense is stimulated only by stopping and starting of the body through space. On a quiet day a cruising airplane gives the passenger no labyrinthine or kinesthetic stimulation. The passenger might just as well be sitting in a comfortable chair in a hotel room as far as sense of movement is concerned, and no dizziness will occur so long as he closes his eyes or confines his visual field to the interior of the plane. Yet let him look out of the window at the earth rushing past at 180 miles per hour and dizziness will result. We are not in

the habit of seeing the earth move past us when we have no sense of movement within us. This lack of the expected correlation of sensations may in turn produce dizziness.

Dizziness is not likely to occur or to be so severe in the individual who is occupied with some difficult manual task. Airplane pilots agree, for example, that they are more likely to become ill as passengers than they are when the responsibility of handling the controls is theirs. Similarly, the driver of an automobile rarely becomes car-sick no matter how sharp the turns in the road may be.

You can go a long way to keep yourself free from seasickness or airsickness if you will knit actively or otherwise occupy your mind and hands during the rough going. Fortunately, practice soon adapts the individual to conditions which at first produce vertigo. You are much more likely to get sick on your first ship or plane ride than you are after you have become a seasoned traveler.

Emotion has considerable influence on dizziness. Complaints of dizziness are among the first symptoms in neurasthenia. The element of fear undoubtedly plays a very important rôle in causing sickness among inexperienced sea and air travelers.

### *Our Sense of Smell*

THE SENSE of smell has little significance in man for the sheer business of keeping alive, but it is closely tied up with our pleasure in living. The size of the perfume industry is proof of that. Much of the enjoyment of flowers and food can be traced to the element of odor. On the other hand, rentals are low in the vicinity of the stockyards and the glue factories.

The receptors which function in the sense of smell are located in the upper passages of the nostrils and are stimulated when chemical substances in vaporous form, given off by such things as flowers, perfume, food, or garbage, are carried with the inhaled air into the nostrils.

There is considerable confusion regarding the number of fundamental qualities of smell. Careful observation of sensory experience reveals six: spicy, burnt, resinous, flowery, fruity, and putrid. It is impossible to tell whether or not each of these qualities has a separate end organ, because their protected location in the nose

makes it impossible to map the sensitive areas as we do in the case of pain, pressure, warmth, and cold. In a general way, those odors which belong to the fruity, flowery, spicy, and resinous groups are voted by most people to be pleasant. The odors in the putrid and burnt groups are usually considered to be unpleasant. There are, however, great individual differences. Some people like garlic and onions and find the geranium so sweet as to be cloying.

Certain odors leave long-continued after-effects. For example, a good whiff of kerosene will cause everything smelled in the next few minutes to smell of that substance. An unscrupulous lawyer once took advantage of this fact to obtain acquittal of a client on trial for setting fire to his business establishment in order to collect the insurance. The main evidence presented by the State was the testimony of the firemen that they had smelled kerosene upon breaking into the burning shop. The attorney for the defense suggested that the firemen were obsessed with the notion of arson, that they had hallucinations, and were hence unfit to testify. To prove his point, the dishonest lawyer passed several small bottles to the firemen and asked them to say what was contained. The firemen reported after sniffing each that all contained kerosene. The "shyster" lawyer then turned in triumph to the jury and asked them to smell the bottles. They reported that only one contained kerosene, the others containing perfumes of subtle fragrance. The explanation is simple. The bottles were passed to the firemen with the one containing kerosene first on the list, while in the case of the jury the perfumes were passed first and the over-powering kerosene last. Nobody noticed the difference, and justice was defeated by trickery, since the jury willingly believed after so convincing a demonstration that the firemen really were "smelling things."

### *Our Sense of Taste*

**T**ASTE, like smell, is not particularly necessary for life, but it too adds greatly to the joy of living in so far as the appreciation of good food is concerned. There are four elemental qualities of taste—*sweet, sour, bitter, and salt*. Sour-sensitive spots are

located mainly along the sides of the tongue, the sweet along the tip, the bitter at the base, while salt-sensitive spots are found on the tip and sides of the tongue. Notice how neatly the taste of the quinine pill is stymied by the bitter-sensitive base of the tongue over which it must pass in being swallowed. Saccharine is sweet when tasted on the tip of the tongue and bitter when tasted on the base of the tongue. When the same substance activates two different sets of receptors, each will give rise to its own characteristic sensation.

In taste, as in vision, we have contrast effects. The lemonade tastes sour if we eat our cake first. Likewise we have complementary tastes, mixture of which tends to neutralize both. Sugar takes the sourness out of lemonade. Sweet and bitter also tend to neutralize each other. Bitter and sour are complementary to a less extent, as are salt and sweet.

What we call flavor in food includes far more than mere taste. Added to the taste elements are warmth and cold, cutaneous and kinesthetic impressions, mild pain in some cases, and smell. To prove to yourself the importance of smell, eat a meal with the nostrils plugged tightly. Recall how flat and insipid food tastes when you have a cold.

The receptor cells of the sense of taste are activated by some sort of chemical stimulation by the material tasted. These receptors are located in clusters called "taste buds." The new-born baby has his full quota of taste buds—about 245 of them. As the individual passes middle age, there is a marked tendency for the number of taste buds to decline. In some very old people no taste buds whatever are found. This progressive loss of taste buds is accompanied by a corresponding loss in the sense of taste and in the ability to enjoy good food. Old people who complain that their meals taste flat are not merely crotchety and hard to please; they are simply unable to taste as well as they once could.<sup>16</sup> Smoking reduces the taste sensitivity temporarily.<sup>17</sup>

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Through the combined action of his various sense organs, man is able to adjust himself to the objects which surround him. Vision is probably the most important sense, with hearing a close second



and our senses of touch and body position ranking next in importance. The senses of smell and taste are not essential to life, but clearly they contribute much to its enjoyment.

The normal human being can distinguish three characteristics of a visual sensation, intensity, saturation, and hue. The color-blind person is unable to distinguish some or all of the hues. To the completely color-blind person the world is made up of shades of gray. For the normal person the visible hues mix according to laws which are made clear by reference to the color wheel. The color wheel also helps to summarize the rules of harmony in color combinations.

There are three characteristics of auditory sensation: pitch, or tone; intensity, or loudness; and timbre, or quality. Tones combine to give pleasing or displeasing effects, but individual tones in isolation are neither pleasant nor unpleasant. Music and poetry add rhythm to the tonal elements in sound and produce more interesting and pleasing effects than could be had through tonal combinations alone.

The various skin senses keep man in touch with the objects which come in direct contact with his body; the senses of bodily position and balance literally keep him on his feet. The sense of smell and taste contribute greatly to the enjoyment of life.

We are able to perceive space through any of the sensory departments, but vision and hearing are by far the most important senses in this regard because they are long-range senses. Through vision, and to a less extent through hearing, we are able to respond to objects which are at a great distance from us. Objects in different positions in space stimulate us differently. For each position of an object there is a pattern of sensory stimulation. As we live and learn about the physical world about us, we attach labels to each of the characteristic patterns of stimulation. If the normal physical relations of the world are interfered with in such a way that an object which is in reality at one point in space gives rise to a pattern of stimulation typical of that afforded by the same object in a second position, the object will be perceived as being in the second position. Illusions of this kind merely illustrate the normal processes of perception. When our sensory impressions are conflicting, we become dizzy.

### *Recommended Readings*

CARR, H. A. *An Introduction to Space Perception*. Longmans. Green, 1935.

How our senses coöperate to give us a clear picture of where we are in space.

CUTSFORTH, T. D. *The Blind in School and Society*. Appleton-Century, 1933.

A blind psychologist discusses the psychology of the blind.

EWING, I. R., and EWING, A. W. G. *The Handicap of Deafness*. Longmans, Green, 1938.

A working source of information for the deaf and hard of hearing and for their teachers and associates.

HAYES, S. P. "The Psychology of Blindness." In H. LENDE, *What of the Blind?* American Foundation for the Blind, 1938.

A review and discussion of the scientific findings with regard to the blind.

KETCHAM, H. "Color Schemers." *Harper's Bazaar*, 1937.

A color engineer tells how to enjoy the world of color.

LUCKIESCH, M. W., and MOSS, F. K. *The Science of Seeing*. Van Nostrand, 1937.

How to see quickly, certainly, and easily.

RAWDON-SMITH, A. F., *Theories of Sensation*. Macmillan, 1939.

Pretty technical.

STEVENS, S. S., and DAVIS, H. *Hearing: its psychology and physiology*. Wiley, 1938.

Complete and authoritative.

WRIGHT, W. D. *The Perception of Light*. Chemical Publishing Company, 1938.

A factual account which points out many applications to practical problems.

*"Let Observation with extensive view  
Survey mankind from China to Peru;  
Remark each anxious toil, each eager strife,  
And watch the busy scene of crowded life."*

DR. JOHNSON

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## CHAPTER 8

# HOW WE OBSERVE

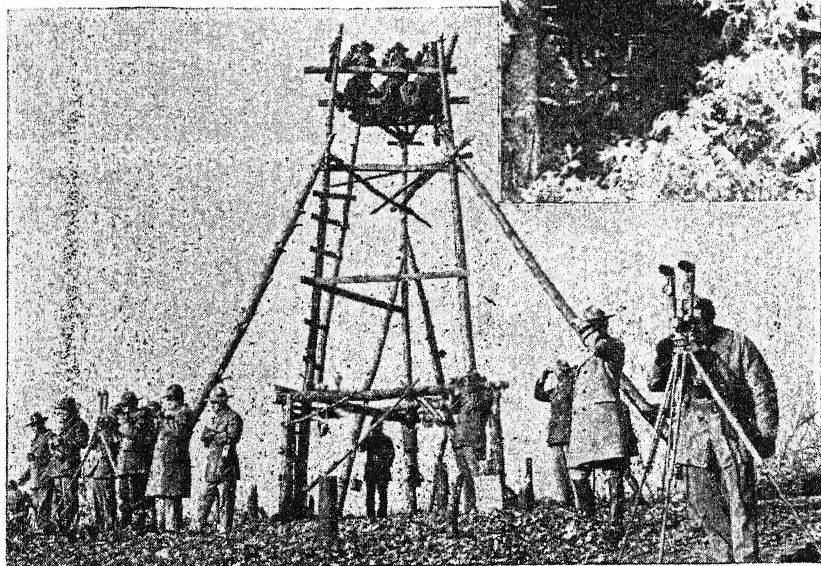
*Man gains knowledge by observation, but man's observations are best when he brings knowledge to them. How attention prepares us for perception. . . . and how perception ends in action or meaning.*

ACCURATE OBSERVATION is extremely important in social life. Do you have difficulty remembering a name or a face? If so, the chances are that your memory is not at fault but that your original observation was inadequate. You did not "catch" the name properly in the first place. Your enjoyment of social life will be greatly increased if you develop an ability to observe the various characteristics and individualities of the people in a group—their facial expressions, their gestures, their words and acts. This skill can be acquired through practice, and above all, you can learn to observe people without staring at them or seeming to be an observer.

The importance of accurate observation is enormous in certain trades and professions. In the practice of medicine, diagnosis is the basic skill. Diagnosis involves the making of numerous minute

and accurate observations and reasoning from them. If the original observation of temperature, pulse rate, appearance of the skin, sound of the heart, posture, rate and manner of walking and talking is inaccurate or incomplete, the diagnosis will be faulty and

FIGURE 35. *Man-against-man sometimes reaches a contradiction. In war, observing eyes are carefully trained to see what man has desperately tried to make invisible. Strangely enough, the properties of certain types of camouflage are such that color-blind men, able to distinguish in degrees of grayness, have a distinct advantage over men accustomed to color.*



the treatment prescribed ineffectual. The physician has at his disposal numerous instruments, but the fact that he uses aids to observation does not relieve him of the necessity for making fine and accurate observations. So great is the necessity for accurate observations in various phases of military activity that individuals with defective sensory equipment or poorly developed abilities to observe are rejected from active service or are, at least, assigned dull and relatively unimportant duties.

Observation is the psychological term for the apprehension of

relationships between oneself and the physical objects which surround him. Even in perceiving the relationships among external objects, the individual himself is the ultimate point of reference. The first units of distance and direction out of which have developed the more precise and abstract units of modern science were based on simple human experience. To the Indian a certain lake is a two-day journey away. The terms of right, left, above, and below are obviously based on the individual's position as a point of reference. Observation is a very personal thing.

The activity of observing involves three essential processes which merge into each other in such a fashion that one is separated from the others merely for the convenience of study. These three processes are called *attention*, *perception*, and *report*.

### *Attention*

THE LIVING INDIVIDUAL exists in the midst of a turmoil of radiant energies. There are notes too high or too low for the human ear to detect; there are sounds too soft to be heard; above the blues and below the reds of the spectrum there is for the human eye mere empty nothingness. Our sense organs are designed to select from all of the energies about us only certain ones. The others are tuned out just as effectively as we tune out the voice of the radio crooner in order to hear that of the sports announcer. But the selectivity of the human organism goes far beyond mere sensitivity or lack of sensitivity of the sense organs. There is a psychological selectivity, a heightening of response to certain stimuli and a lessening of response to others, which varies from time to time and is more than sensory. Although several stimuli compete, only those which fit the needs of the moment are reacted to. For example, when you are reading an interesting book, the sounds of the clock ticking are not heard, nor does the actual striking of the clock produce any impression. This type of selectivity is called attention.

#### *Ways of defining attention*

Attending can be looked upon in two ways: (a) as an adjustment of the body and its sense organs; or (b) as clearness and vividness of conscious experience. The thing attended to seems

to stand out more clearly than anything else we are experiencing at the moment.

1. *Attention is a postural response.* In attention the body and its sense organs are adjusted better to sense some part of the surrounding world. The garage mechanic is "tuning up" a motor. His head is cocked to one side; he is literally "putting his best ear forward." The physician with his stethoscope is listening for certain faint sounds in the chest of his patient—wheezes which reveal difficulty in the lungs, barely perceptible murmurs which to the trained ear show that all is not well with the patient's heart. The physician's postural adjustment is as complete as is humanly possible. He even closes his eyes to shut out distracting visual stimulation. The golfer shades his eyes against the western sun as he follows with eager anticipation the flight of "the prettiest drive you ever saw." These are familiar examples of the adjustment of specific sense organs to catch better the significant stimuli and to rule out more effectively those which distract.

There is, however, a more general postural adjustment in attention. It is the last of the ninth inning; the score stands 2 to 0 in favor of the team in the field, with the bases full. Look at the shortstop. His posture defines attention in a way that words never can. If ever a man were "on his toes," this one is. He stands flexed but alert, eyes darting here and there, his body ready for instant and coördinate reaction. The outcome of the big game depends on the speed and accuracy with which he will observe the course of the ball.

2. *Attention is clearness in consciousness.* The method of introspection must be relied upon to illustrate this definition of attention. Do you wear glasses? If so, were you noticing the rims just now? Probably not. Yet they are in your field of vision. Look for them, and there they are. Is there a clock in the room where you are studying? Is a radio playing softly in the next room? If so, were the sounds vivid in your consciousness a few seconds ago? Probably not. Listen for these or other sounds to which you were deaf a moment ago, and you will hear them. This apparent change in vividness without correlated change in physical intensity is the phenomenon of attention. Now that your attention is on the sound of the radio, you notice that the announcer is urging you to buy.

### *Factors determining the direction of attention*

What are the factors which make an object or situation exert the greatest pull? This is a problem which is of enormous practical importance in advertising and salesmanship, to take an example. In order that a sales talk or printed advertisement lead to the action of buying, the attention of the prospective buyer must first be attracted. This is not enough in itself, but it certainly is one of the essentials. Likewise, many a potential leader has failed to make an impression upon the minds of the public because nothing happened to attract attention to his qualities.

1. Change. Change is movement in any direction. From one place to another, from one intensity to another, from absent to present, from red to green, from high to low, from going to stopped—all of these are change, and all attract attention. The young kitten ignores the stationary ball of yarn but pounces upon one which moves. There is probably a real biological basis for this fact. Some birds of prey seem able to perceive only moving objects. Animals remaining entirely still are safe from them. The phenomenon of change as a factor of advantage in attention cannot be denied.

2. Size. A large advertisement attracts attention better than a small one; a loud sound, better than a faint one. A shout makes you "sit up and take notice" where a spoken word is ignored. A visual stimulus can, of course, be so large in area that we do not notice it. The picture on the wall is noticed before the wall itself is seen.

3. Repetition. From a distance the crack of a rifle is not so likely to be heard as the repeated rattle of a machine-gun. A weak stimulus frequently repeated may have as much effect as a strong one presented once. There is, however, a limit to the effectiveness of repetition. If overdone, monotony results. Practice shows that repetition of a fundamental theme or motif with minor variations is more effective than exact repetition. An effective advertising campaign repeats an essential idea with numerous small variations. To run the same copy week after week after its attention value has been lost would not be worth while. Music and architecture offer numerous examples of how the attention can



be maintained through repeating the central theme with small modifications.

4. *Striking quality.* Some stimuli are more potent in attracting attention than other, physically stronger ones, even in the absence of previous experience and conditioning. For example, high sounds are pre-potent over low sounds; tickling and itching over broad, smooth pressure; saturated colors over pastel shades.

5. *Organic condition.* Everything else the same, the stimulus which will win the race for your attention is that which relates to the strongest need of the moment. If you are hungry, stimuli related to food will dominate the scene. If you are tired, stimuli related to resting will be most effective.

6. *Social suggestion.* In a general way people attend to what is pointed out to them. This is because they have enjoyed many satisfactions in the past through acting on the suggestions of others. Herein lies the basic explanation of the effectiveness of the following old prank. When in a crowd, start looking intently toward the sky. Move the head slowly as the eyes sweep through a wide arc. Notice that many of the people about you will do the same thing. Even when there is nothing of interest to see, people will respond to social suggestion by paying close attention to something which another person is apparently observing closely. Another harmless trick with a similar psychological explanation is to examine the top tray in the stack at the head of a cafeteria line. Having closely scrutinized the tray and made certain that the people next in line have seen you, scowl slightly and carefully select the second tray. Proceed without comment down the line; you will observe that the next person usually examines the tray which you have rejected, looks perplexed, and finally selects another tray.

7. *Interests.* There is a wide degree of variation among people as to what will attract their attention. The person's own interests, like his organic condition, predispose him toward one particular stimulus or away from another. Let us suppose that a geologist, a farmer, an artist, and a real estate promoter are looking at the same plot of ground. The geologist's attention might be attracted to the layers of rock exposed when the road cuts through a hillside, for such layers are useful in locating oil. The farmer would

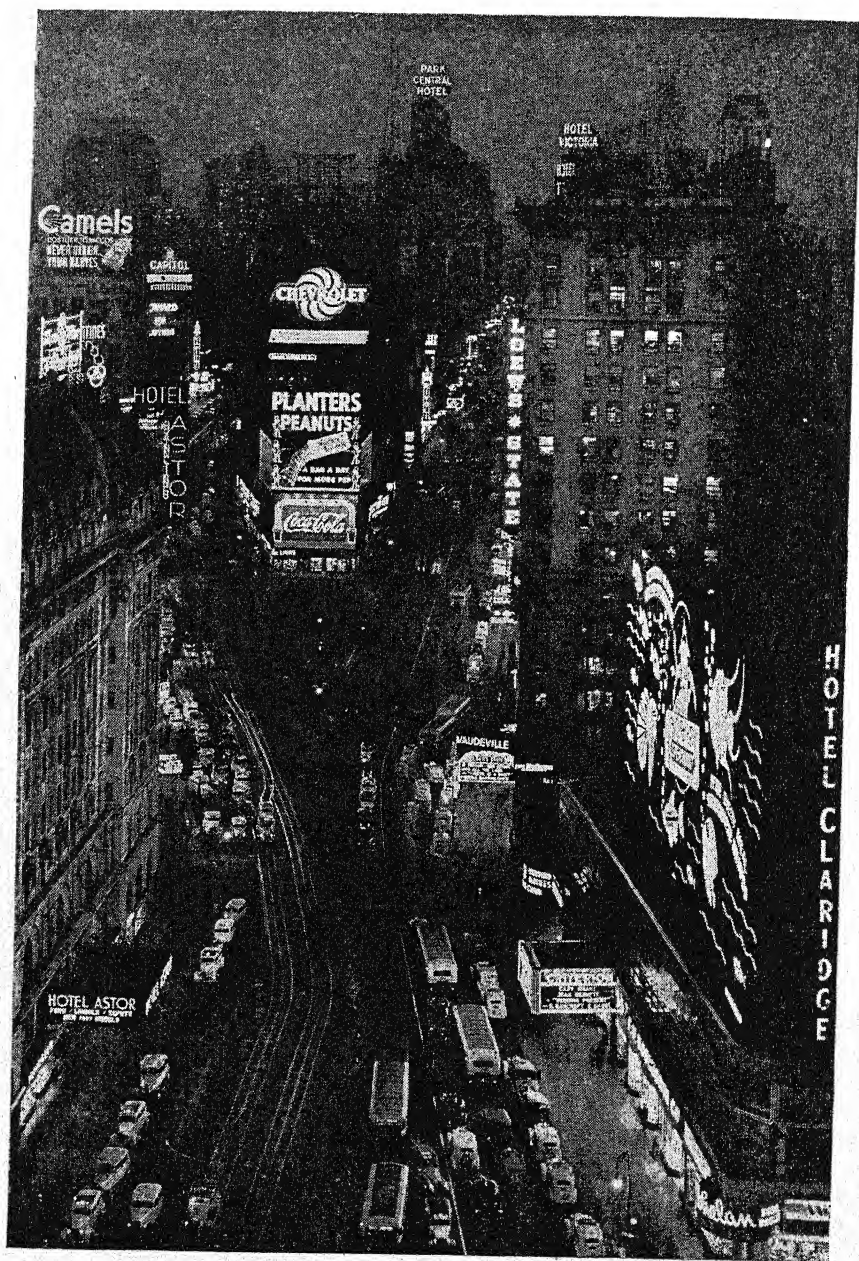


FIGURE 36. All the known principles of advertising—and occasionally a new one—are illustrated on Times Square at night.

probably examine the soil and any plants or weeds growing on it. The artist might walk about until he found the position from which the landscape was a balanced composition to be painted. The real estate promoter would carefully look the property over to see how it could be subdivided. The objective stimulus is the same for all four of these individuals, but their interests differ. Their attention and consequent behavior would vary accordingly.

### *Kinds of attention*

Attentive reactions, like any other behavior of the individual, are subject to modification through learning. The history of their development is told in the same terms as that of any other phase of our reactive equipment. There are certain inborn responses which become modified and elaborated through learning as a result of contact with the environment. This modification goes through three stages: involuntary, voluntary, and habitual attention.

Involuntary attention. Certain stimuli seem to possess a natural potency to attract the attention, as you have seen already. In popular language we would say that we pay attention to these stimuli against our "will." Such pre-potent stimuli are so strong that they win the battle when they come in competition with other activities of the moment. You are busy reading your assignment in psychology; suddenly a loud report outside draws your attention. You stop reading to investigate. Was it a shot? You remember what you have been reading in the newspapers about crime. Finally, you decide that it might have been a shot or it might have been an automobile motor backfiring and conclude that the police are the logical ones to investigate. You return to your studies. The characteristic thing about this natively determined involuntary attention is that it is accompanied by no consciousness of effort. In fact, it requires effort to pay attention to your serious work when some such pre-potent stimulus to the attention is presented.

Voluntary attention. Voluntary attention, on the other hand, requires an effort; it is forced by social pressure or other more or less remote motives. Self-observation during voluntary attention reveals a mass of strain sensations which, taken together, are called

effort. It also reveals the element of conflict. Even though we stick to the task, the victory is not easy. Prolonged voluntary attention ultimately results in boredom.

*Habitual attention.* Habitual attention requires no conscious effort. Characteristic of it is the feeling of interest and pleasure accompanying it. The element of conflict is absent. Habitual attention closely resembles involuntary attention in these and other respects. The important difference between these two forms of attention is in their histories. We arrive at the comfortable state of affairs represented by habitual attention only as the result of practice. In learning to ride a bicycle, for example, the first stage requires close voluntary attention to each movement. Later these become automatic.

It is the duty of the teacher and of the writer of textbooks to arrange their materials in such a way as to appeal to the involuntary attention of the student and to such interests as have already been built up. A liberal sprinkling of attention-getting stimuli will act as sauce to make more appetizing the drier but equally important elements of the subject-matter. Sometimes it seems advisable to present some of the points as "stunts" rather than as formal experiments. Such things help bridge the gap between the forced voluntary attention stage and the final, easy, effortless stage where attention becomes habitual, because the individual has developed an interest in the subject. The person who is interested in a large number of things is a happy person. For him the world is full of satisfactions. One of the greatest functions of education is to give the individual interests (create habitual attentive adjustments) in varied subjects and situations. Once this has been done, the learning of facts will take care of itself. But there is no easy road to effortless attention. Everyone must go through the effortful stage. The teacher and writer can only make it easier; they cannot do the whole job alone.

### *The shifting of attention*

The individual's attentive adjustment is not stable and fixed. Attention is constantly shifting from one part of the scene to another.

Notice the eyes of a person who is looking at a picture. You

will see that they dart here and there, pausing but a short time in any one position. This is typical attentive exploration of a scene. Notice the behavior of a person upon first entering a room. Observe how his eyes dart from face to face. This exploratory behavior is preparing the way for perception.

There is also involuntary fluctuation of the attention which is just as real though not so easily noticed. This may be demonstrated in the auditory sense field by holding a watch far enough from the ear so that you can barely hear it tick. Now listen to the ticking, and you will observe that it grows in apparent intensity, and then fades away to a point at which it cannot be heard, then grows again, etc. The period of these fluctuations varies with the individual and the conditions of the experiment between a fraction of a second and several seconds. Similar results can be obtained by fixing the gaze on a faint gray smudge on a blank sheet of white paper. Regulate the distance properly, and you will observe the same oscillation of the subjective strength of the sensation aroused. These experiments demonstrate the important fact that adjustment of the sense organs and attentive adjustment are not entirely the same. It is possible to fix the eyes on a stimulus and maintain that fixation and yet have fluctuations of attention. You have had the experience in an absent-minded moment of staring at, without seeing, an object you are looking for. In that case there is adjustment of the sense organs without attentive adjustment.

### *The distraction of attention*

Distraction is simply attending to something else. The factors of advantage of distractions are accordingly those of attention itself.

Sources of distraction. It is almost impossible to protect oneself completely from the distracting effects of bright, flashing lights. Loud sounds are also well-nigh inescapable. About our only recourse is to turn our heads and plug our ears. Olfactory distractions (smells) are not so serious, because we soon become used to them. Touch distractions may be avoided. Taste distractions are easily controlled. A room which is too cold or too warm interferes with efficiency in working.

When the distracting stimulus is in the same sensory modality

as the one you are attending to, the distracting effect is greatest. Extraneous sounds greatly disturb the physician who is listening for a faint heart murmur. Bright lights flashing in one's eyes interfere especially with close visual attention.

Not all distractions come from the outside, however. Worries and vague objectless fears can intrude to interfere with the work at hand. In one investigation it was found that taxicab drivers who had family worries were more prone to accidents than those who were not so hampered.

*The cost of distractions.* The most obvious effect of a distraction is an actual reduction in efficiency. Laird conducted an experiment to determine the cost of distraction in terms of energy required per unit of work.<sup>1</sup> His subjects were typists. On some days they worked under conditions of quiet produced by enclosing them in cubicles of suitable size constructed of a sound-insulating material. On other days they worked in the same places except that the partitions were removed so that the usual office noises prevailed. Energy cost was measured by having the girls breathe out into a bag specially constructed to capture the expired air. This was analyzed to determine the amount of carbon dioxide, and from this the consumption of oxygen was computed. The amount of typing accomplished was the same under the two conditions, but the energy cost of the typing done under noisy conditions was decidedly greater than that of the same amount of work done under conditions of quiet. The obvious conclusion is that the employer who makes his stenographer work under noisy conditions will obtain as much work from her for awhile as he would were conditions better, but she may be expected to "break down" sooner.

Laird's results have recently been confirmed in a similar experiment by Freeman.<sup>2</sup>

*Overcoming distractions.* The bad effects of distractions can, obviously, be prevented by removing the source of distraction. For example, when you study, remove as many distractions as possible. Turn off the radio; don't let the light shine in your eyes, etc.

Because noise has become such an important source of distraction in our large cities, many efforts are now being made to combat this evil. The drive against din is on. Horses which draw milk



trucks through the city streets wear rubber shoes; the trucks themselves are mounted on pneumatic tires. Ash-cans are provided with rubber cushions. Efforts are being made to reduce the noise of elevated trains and street-cars. In some cities it is against the law to sound an automobile horn except in an emergency. This is only a sample of what is being done to combat the high energy costs of noise.

But the control of the objective factors in distraction is not nearly so important as the control which must come from within us. Inattention is usually lack of interest in the matter at hand and as such is a personality problem. Explore your own motives and find out why the distracting thing is more interesting. This may suggest the cure. Remind yourself of the importance of the matter at hand. If this is study, you might think of the grade and of what a failure would mean to you and to your parents. Seek to connect the subject-matter with everyday problems. All this will help. But don't forget that the longer you stay with a subject the easier and more interesting it will become.

Distraction implies a conflict between two competing stimuli or activities. Conflicts are painful and costly. The sooner a conflict is resolved, the better. When confronted by uncontrollable distractions, it is sometimes better to give in for the moment and come back with renewed resolve than to seesaw irresolutely. The latter accomplishes nothing and leaves one completely discouraged and tired.

*How the magician uses distractions.* A famous magician once said that he would rather play before a group of scientists than before a group of newsboys and cab drivers. His experience had been that "the more intelligent they are, the harder they fall." Most of the magician's tricks are quite simple. Their success consists in getting the audience to pay attention to some action which has nothing to do with the executing of the trick. While the attention of the spectators is thus riveted on the hocus-pocus of the right hand, the left hand is slowly doing its part without being seen. In some tricks of the professional magician it is necessary for an assistant to carry some large object on or off the stage, presumably in full view of the audience. This is done so quietly while the "Professor" holds the attention of the audience, that it



is never seen. The more intelligent the spectator, the easier it is to interest him in the more obvious action and obtain his complete attention, thus reducing his chances of detecting the trick.

## *Perception*

PERCEPTION is the second stage in the process of organizing sensory data by combining them with the results of previous experience, whereby one learns how he stands in relation to the objects and conditions of the physical world. Of course, part of perception consists in labeling the relationships between objects, but this is done ultimately in reference to oneself. For example, the child learns to say that one thing is nearer or farther than another, above or below, to the right or to the left, long before he learns to classify physical relationships in space in some more abstract fashion, such as north or south, or in terms of degrees of latitude or longitude.

### *Perception may end in action, meaning, or belief.*

How one will react in a given situation will depend upon how that situation is perceived. It is quite possible for the same physical situation to be perceived in two different ways by two different persons or by the same person at two different times. The action need not actually occur at the moment the object is perceived. The observer might merely label it for future behavior.

"Seeing is believing" goes the old saying. Perception carries conviction that what we are perceiving is a true representation of what is there. The illusion or false perception is false only after we compare it with what we know to be true. To the uninitiated, a stick seen partly through water and partly through air does not seem bent; it is bent.

### *Perception is a process of "filling in."*

It is not necessary that a perceived object stimulate directly the sense organs of the perceiving individual. In fact, in most pictures of objects part of the object is missing, but the whole object is perceived from such parts as are present. In a picture of a chair, for example, one of the legs is usually not shown. In

the drawing of a man only one side is pictured. Yet we know in looking at the sketch that the other side is there.

The ability of the individual to perceive a series of fragments as the whole object depends upon many factors. The intelligence of the perceiving individual and his mental set are extremely important among these. Look at Figure 37. What is this? Turn

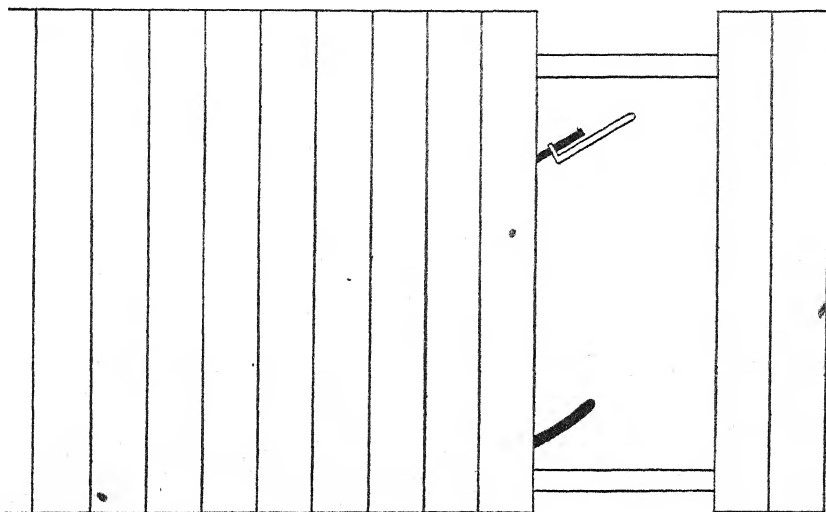


FIGURE 37. What is this? With one hint a few details can become a complete picture. (See end of chapter.)

to the end of this chapter to find out. Return to the incomplete figure, and you will have no difficulty in “seeing” what the picture is. As a rule, a more intelligent person needs fewer details to perceive the whole than are required by the less intelligent.

### *Factors determining what we perceive*

A group of elements in a complex situation are seen sometimes this way, sometimes that. Here, as in attention, it is possible to discern several factors operating to make us perceive one particular possibility rather than another.

1. Nearness. The nearness of the elements to each other makes for their perception as parts of a pattern. Look at the row of dots in Figure 38. Do you see four groups of dots or some other number of groups?

FIGURE 38. NEARNESS influences perception. The dots which are close to one another seem to go together.

2. Likeness. Elements which are alike tend to be perceived as belonging together. Look at the squares in Figure 39. You will observe that the squares composed entirely of circles or of X's will be seen more clearly than those made up of both circles and X's.

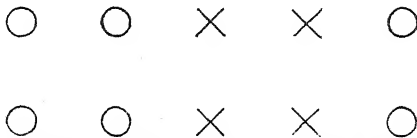


FIGURE 39. LIKENESS influences perception. We see a square made of X's or of O's, but not one made of X's and O's.

3. Familiarity. When elements are thrown together in chance order, we tend to see familiar objects. When you look at clouds against the sky, you see faces, animal forms, or even buildings rather than unfamiliar and meaningless figures.

4. Inclusiveness. The pattern which "uses up" all the elements is the one which has the advantage in perception. Notice in Figure 40 that you see a torpedo, which is formed by all of the dots rather than a square formed by the four middle dots with two dots left over.



FIGURE 40. INCLUSIVENESS influences perception. We see the torpedo which uses up all the dots.

5. Part-whole relationship. Parts of a situation are perceived as belonging to a whole. The manner in which the whole is perceived will influence the meaning of the part. This is another way of saying that what we see depends upon surrounding conditions.<sup>3</sup> Look at Figure 41. The same set of lines may be seen as forming a block of wood or as outlining a recess in a block of wood. The lines are physically the same, but their meaning depends upon the whole to which they belong.

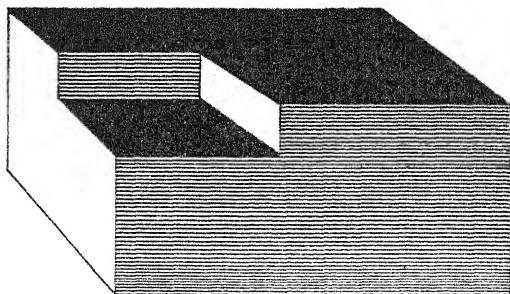


FIGURE 41. *Cut out or glued on? The whole determines the part.*

The part-whole relationship has received a great deal of attention from certain psychologists who claim that learning and past experience cannot explain this and related phenomena.

6. *Interest.* We see what we like to see. The "laws" of perceptual organization outlined above are not absolute. Attach any interest to a pattern, and it will gain over other combinations.<sup>4</sup>

### *The shifting of perception*

The same objective situation may be observed in several ways. When a situation may be perceived in more than one way, there is a quick, automatic shifting from one to another. Look at Figure

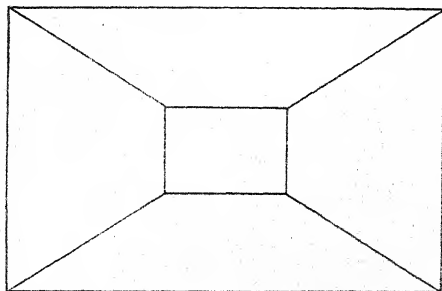


FIGURE 42. *Much depends on how you look at things in life. Perception can shift—and shift—and perhaps lead to new solutions.*

42. This is a picture of a hallway leading away from you. The more distant end of the hallway is shown in perspective by its smaller size. Now look at the drawing again, and you will see that it is a square megaphone with the mouthpiece toward you. Continue to gaze at the figure, and you will notice that the perception

shifts back and forth from moment to moment. First it is one; then it is the other of the two possible objects.

This shifting of perception has a distinct biological advantage. It often happens that the elements of a problem situation may be so perceived that no solution is suggested. Later, the perception of the situation shifts in such a way as to suggest the solution. The manner in which an ambiguous situation will be perceived will depend upon what one is looking for at the moment. Figure 43 may be seen as a staircase right side up or as one upside down. Wait until you see it right side up; then imagine that a carpet is placed in the exact center of the treads, that this carpet is tacked down by shiny brass-headed tacks. Imagine that you are

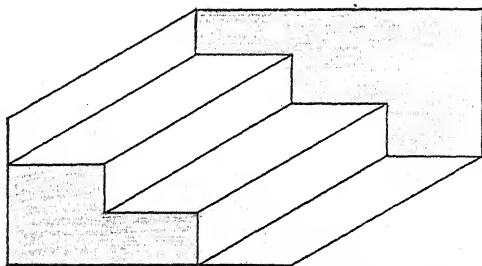


FIGURE 43. *The reversible staircase, and similarly elusive perceptions, can be kept in place by the mental addition of details, for example, a carpet.*

starting at the bottom tread to pull out each of these tacks, working your way to the top. If you follow these instructions carefully, you will observe that the staircase does not shift, or at least shifts less often than when you regard the figure passively.

### *How we perceive time*

We are living in a world dominated by timepieces. Our daily activities demand that we adjust ourselves to the time dimension of the world as well as to the relations of physical objects to each other in space. Much of our population is virtually enslaved by the clock. The executive who must be at his desk for a nine o'clock appointment is no more free than the school-teacher who must be ready promptly at 8:40 A.M. with her: "Now, class, we are going to extract the square root. . . ." Neither of these is freer than the mechanic who must "punch the clock," although the latter is more frequently reminded of his slavery.

*How we perceive short intervals.* Numerous investigations show that the ear is the most accurate instrument for the perception of short intervals. Many lines of evidence convince us that the mechanisms involved in the perception of short intervals are quite different from those we use to tell longer periods without the use of clocks. That the perceived length of short intervals of time is somehow related to the speed with which life activities go on in our tissues has been shown by a careful experiment performed by a French psychologist.<sup>5</sup> This worker tested the ability of normal subjects to designate a duration of a specified length. A series of intervals of gradually increasing length was presented, and the subjects were to signal when one of the specified length occurred. The subjects were then put in an electric apparatus whereby their body temperatures were elevated several degrees. They were tested again, and it was found that shorter intervals were now designated. In other words, as a result of the higher temperatures their lives were being lived faster, and a given amount of physical time had more effect on them.

*How we perceive long intervals.* Plautus had some understanding of the process of time perception when he wrote:

When I was young, no timepiece Rome supplied,  
But every fellow had his own—inside;  
A trusty horloge, that—rain or shine—  
Ne'er failed to warn him of the hour—to dine.

Can you upon going to bed "set yourself" to waken at any designated hour, regardless of how sleepy you are or of how soon that hour is to arrive? Many people can do this so accurately that they do not need alarm clocks.

Most of our physiological processes are correlated nicely with time. There is a distinct rhythm in our periods of hunger. This can be taken advantage of in the way described in the verse above. There are many changes inside us which reveal the passage of long intervals of time, whether we are awake or asleep. The tension on the bladder increases with the passing of time until relieved. As time passes, we become more and more tired. The "time to go home" becomes apparent without looking at a clock when a certain degree of sleepiness comes over us. People in whom

visceral insensitivity exists are notoriously unable to perceive time by their own subjective experience but must rely entirely upon clocks to know when it is time to quit. In a case of visceral insensitivity, described by D'Allonnes, a woman who had no emotional feelings also had no sense of time as lived. She could tell time by the clock but from her own inner life did not know a few minutes from a few hours.<sup>6</sup>

*Ability to perceive time varies with age.* Children are quite poor in ability to perceive time. The average three-year-old child can point on command to his nose, eyes, mouth, and hair; can name a key, penny, closed knife, watch, and pencil; can tell whether he is a girl or boy; knows his last name; can repeat after one hearing such a sentence as "I have a little dog"; can give a series of three digits correctly after hearing them pronounced once. It is not until the average child is *six years old* that he can tell you whether it is morning or afternoon. His ability to think in terms of the future is even slower in developing.<sup>7</sup>

Accuracy in judging intervals of time improves enormously between the tenth and sixteenth years.<sup>8</sup> Children were asked to estimate intervals of five seconds and of five minutes. As a measure of their accuracy the average error was used as the score; that is, the amounts that the children ran over or under the standard were averaged together and tabulated. The smaller the average error, the better the accuracy. Table 10 shows the results.

TABLE 10: *Errors of Children (Aged 10 and 16) in Estimating Time Intervals*

AGE OF CHILDREN	AVERAGE ERROR FOR FIVE SECONDS	AVERAGE ERROR FOR FIVE MINUTES
10 years	4.1 seconds	170 seconds
16 years	1.6 seconds	91 seconds

*The effects of activity on our sense of time.* Time spent in monotonous work is *overestimated*. Time spent in interesting work is *underestimated*. In one experiment two subjects were engaged in the dull task of sorting balls.<sup>9</sup> At various intervals each was asked to estimate the length of time already spent. The amount of error in the estimation was correlated with the degree of boredom reported by the subjects. The records of one subject follow:



TABLE II: *Estimation (in Minutes) of Time Intervals Under Differing Conditions*

ACTUAL TIME IN MINUTES	ESTIMATION WHEN SLIGHTLY BORED	ESTIMATION WHEN GREATLY BORED
30	25	30
50	50	55
70	75	85
90	100	110
100	110	120

Harton has recently shown that time spent in making easy discriminations is estimated as longer than time spent in making difficult discriminations. This confirms the above experiment, for easy work soon becomes boring.<sup>10</sup>

The effect which interesting activity has on the speed with which time seems to pass differs greatly from the apparent length of an interval when examined in retrospect. You have all noticed how fast the day passes when it is filled with interesting activities. You arrive at the end of the busy day without knowing it. The time did not drag as it does when you are engaged in dull routines or had nothing to do. At night, as you think back on the events of the crowded day, it seems ages since you got up that morning. Thus the interestingly filled interval seems long as you look back on it, although it passed rapidly at the moment.

Successful activity is judged to occupy less time than unsuccessful. Harton had subjects learn mazes.<sup>11</sup> Some of them were encouraged by being told how well they were doing. Others were disparaged. Those who felt successful judged the time shorter than those who felt they were failing.

In general, time spent pleasantly is estimated to be shorter than time spent unpleasantly.

*The effects of drugs and disease on our sense of time.* Certain drugs greatly upset our ability to note the passage of time. Among these are opium and morphine, but Indian hemp (hashish), or marijuana, is most upsetting. Under the action of this drug short intervals seem to be long. Subjects emerging from marijuana drunkenness of a few minutes say that their dreams have lasted for hours or even years. There are also diseases in which the sense

of time is lost completely. Each day has to the patient no beginning and no end. Time seems to hang suspended.

*Is there extra-sensory perception?*

During the past few years a great deal of publicity has been given the problems of clairvoyance and mental telepathy. Results of "experiments" were broadcast. As a result, the psychologist often is asked: "What is there in extra-sensory perception?"

Extra-sensory perception, or E. S. P., is said to comprise two closely related phenomena: (1) mental telepathy, or the passage of awareness from one mind to another without intervention of the sense organs; and (2) clairvoyance, or becoming aware of a physical object without the use of sense organs.

A typical mental telepathy test is conducted as follows. There is a deck of 25 cards containing five cards for each of five different symbols—star, circle, square, plus sign, and parallel wavy lines. After the cards are shuffled, one subject, the "sender," picks up a card and studies it carefully, while the other subject, the "receiver," tries to read the mind of the first subject. After the receiver has called out "square," "circle," etc., the judgment is recorded as a hit or a miss. In clairvoyance experiments the cards are shuffled, and the "receiver" (there is no "sender" other than the cards themselves) attempts to record the order of the symbols in the pile of cards.<sup>12</sup>

Numerous critics have pointed to two important sources of error in clairvoyance and mental telepathy experiments: (1) poorly controlled experimental conditions, especially with regard to the operation of cues, such as shadows and changes of voice or expression on the part of the sender; and (2) inadequate statistical procedures.

Kennedy, for example, discovered that the standard E. S. P. cards could be read from the back.<sup>13</sup> In the printing process the card had been affected in such a way as to leave on the back of the card an easily readable impression of the symbol on the face of the card. The impression is so clear that it shows in a photograph of the back of the card! Collier has shown that cues can be used by a subject without his being aware that he is using them.<sup>14</sup> If the subjects in the telepathic experiment are adequately

isolated from sensory communication, negative results are usually obtained.<sup>15</sup>

Even with complete control of experimental conditions, there have been errors of a statistical nature in certain E. S. P. experiments. Leuba has recently indicated some of them.<sup>16</sup>

Psychologists as a whole are not convinced of the reality of extra-sensory phenomena. Warner and Clark<sup>17</sup> asked a group of qualified psychologists to check one of five statements to show how they stood on the matter of 'extra-sensory perceptions. The question, the alternative answers, and the number of psychologists expressing each attitude follow:

*In your opinion, is "extra-sensory perception":*

1. An established fact . . . . .	5
2. A likely possibility. . . . .	26
3. A remote possibility. . . . .	128
4. An impossibility. . . . .	51
5. Merely an unknown. . . . .	<u>142</u>
<i>Total</i> . . . . .	352

Psychologists, though not convinced of the reality of the phenomenon of extra-sensory perception, are open-minded on the subject, as shown by the fact that "merely an unknown" received the highest vote of the five alternatives.

*Reporting Our Observations*

SINCE WE ARE LIVING with people and sharing our observations with them, the study of observation would be decidedly incomplete without some reference to the way in which we report our observations to others. Accuracy in reporting is the only way they have of estimating the accuracy of our observation.

The report of an observation does not have to be made to some other person. The observer may merely report to himself. That is to say, he may give some name or label to the things he observes. The person who has a wealth of descriptive terms to apply to the things he sees will actually see more than the person who lacks an adequate vocabulary. Leaving aside the consideration that men are more often color-blind than women, women are more sensitive to the color of fabrics, because they have a richer supply

of exact terms, such as henna, russet, maroon, crimson, beige, ruby, and auburn, to apply to fabrics which men would simply call red or brown. An Eskimo suddenly transplanted to Times Square, New York, would make little of the sights and sounds around him, for he would lack terms necessary in reporting his observations to himself or to one of his own race.

### *How quickly we observe and report*

We are living in an age of emphasis on speed. Great reputations have been made in industry by men who have been able to speed up production and hence reduce the manufacturing costs per unit. Many of the methods which have been adopted owe their success to the application of certain solid psychological principles. The emphasis on speedy perception is not limited to industrial applications and practice, however, but permeates our everyday lives. Especially is this true for the person who drives an automobile. For him, it is not only advisable but actually essential to perceive situations accurately and rapidly.

The next time you go to a movie in which one of the actors tells a joke or makes a clever remark after an interval of serious action, notice when the different members of the audience commence to laugh. You will see that some start to laugh long before others, while some are very tardy in showing their mirth. If you were to measure the time that elapsed from the moment the actor springs the "nub" to the moment when a particular person laughs, you would have measured that person's reaction time.

In the psychological laboratory the reaction time is measured with a high degree of accuracy. In fact, the unit in which reaction times are measured and expressed is equal to  $1/1000$  of a second. This short interval of time is called a millisecond (msec.) or a sigma ( $\sigma$ ). To obtain such accurate measurements, special apparatus is required. The typical setup for a reaction-time experiment consists of three parts: (1) a stimulus key which is pressed by the experimenter to stimulate the subject and at the same time to start a clocklike mechanism going; (2) a reaction key which is pressed by the subject the moment the stimulus is perceived and which, at the same split instant, causes the timing mechanism to stop; and (3) a device for checking the accuracy of the timing

mechanism. The timing mechanism, or *chronoscope*, is frequently a sort of telechron clock run by electric current, with a frequency of pulsation controlled by a tuning fork. The accuracy of the clock is checked against the time required for a ball-bearing to fall a certain distance. This is the most accurate method known to science of checking small time intervals. All this complicated apparatus merely serves to measure the amount of time elapsing between the presentation of a stimulus and the execution of a prescribed response.

*Reaction time depends upon the sense organ.* Certain sense organs give rise to rapid reaction times; others, to slower ones. Table 12 shows reaction times for the different sense organs as determined by many investigators.

TABLE 12: *Average Reaction Times of Various Senses*

SENSE ORGAN STIMULATED	REACTION TIME
Visual	.150 second
Auditory	.120 second
Tactual	.115 second
Olfactory	.200 second
Gustatory	.300 second
Pain	.400 second
Cold	.150 second
Warmth	.180 second

Notice that the eye is slower to respond than the ear. That the reaction time in braking an automobile is slower in response to a red light than in response to a horn has recently been established.<sup>18</sup> The visual stimulus does not stimulate a nerve-ending directly. When light enters the eye, it sets up a chemical reaction which in turn stimulates the nerve-endings. This chemical reaction takes a certain amount of time. In the case of the ear the stimulation is mechanical rather than chemical; the sound wave is translated into pressure by the ear-drum and the attached three small bones known as the hammer, the anvil, and the stirrup. The reaction times of taste and smell are also long as compared with the others. These, too, are chemical senses. Compare the reaction time for warmth and cold. Pain has the slowest reaction time of all.

*Reaction time depends upon the strength of the stimulus.* The stronger the stimulus, the quicker the reaction time for all sense

organs, although in the case of light this difference is rather negligible. In one experiment it was found that the reaction to a stimulus of moderate intensity was 191 milliseconds, while the reaction time to a stimulus one-tenth as strong was slower by only 17 milliseconds.<sup>19</sup>

Similar effects are obtained when we increase the area of exposure of the stimulus or when we increase the duration of the stimulus.

*Reaction time depends upon the nature of the fore-period.* At the track meet the starter says to the competing runners, "On your marks—set—" BANG! The pause which elapses between the "set" and the "BANG" is usually varied by a skilful starter so that the runner cannot anticipate the exact moment of the pistol shot. Careful experiments have shown that the reaction time is shorter when the subject is warned. Some time is required to build up the state of readiness to respond making for the quickest response. Consequently the fore-period should not be shorter than one second. On the other hand, the state of readiness to respond cannot be maintained for more than about four seconds. Therefore, the warning should come about one to four seconds before the final stimulus. The experienced starter varies the period of warning within these limits; the runners are thus forced to respond to the sound of the gun itself rather than starting just before they expect the gun in order possibly to get the "jump" on the others.

Davis measured muscular activity during the fore-period of a key-pressing reaction and found that muscular tension in the forearm increases toward the end of the fore-period and is greater during any part of the fore-period than when at rest.<sup>20</sup> He found reaction time to be quickest when the muscular tension at the end of the fore-period is greatest.

*Reactions become quicker with practice.* The time of reaction becomes shorter with practice, but this improvement is largely limited to the first trials. The physiological limit of reaction time to a particular stimulus and under given environmental conditions is soon reached. Another effect of practice on reaction time is the reduction in the variability from one time to the next as the subject becomes adjusted to his task. At first the subject is quite variable, but later his reaction times come to cluster closely around

a central point. Much of the effect of practice on reaction time results from the subject's learning to ignore distractions and pay close attention to his task of responding as soon as the stimulus is perceived.

*Reaction time varies with age.* Representatives of the Galton Eugenics Laboratory in England set up apparatus for measuring reaction time at various public places, such as railroad stations and fairs.<sup>21</sup> They had thousands of people serve as subjects out of curiosity or to kill time while waiting for a train. They found that reaction time decreases from infancy until the age of maturity and then increases in adulthood and old age. The performance of a seventy-year-old is about equal to that of a child of ten.

Similar results have been obtained with large groups of subjects tested on a brake reaction apparatus.<sup>22</sup> Here it was found that a man of forty-five years is slower than a boy aged fifteen years.

*The effects of complexity of the reaction.* In the reaction-time experiments, the results of which we have thus far been considering, the subject knew in advance what his response was to be, and he also knew in advance what stimulus to look for. The stimulus in successive trials was always the same. Here the problem was that of discriminating the stimulus from no stimulus. In other reaction-time experiments the conditions are arranged so that the subject is to react in one way if a particular stimulus is given and to do something else in response to another stimulus. For example, the subject is instructed to press a key with his *left* hand when a red light flashes, but to press a key with his *right* hand when a green light flashes. Such experiments are called *discrimination*, or *choice*, reactions. Reaction times under these more complicated (and more lifelike) conditions would be expected to be considerably longer.

Henmon used the following method in studying this problem.<sup>23</sup> Two stimuli were presented simultaneously. If the longer, stronger, or higher one appeared to one side, a certain hand should be used to press a key; if to the other side, the opposite hand was used. In other experiments red and blue flashes were presented simultaneously and the subject asked to press the key to the right side when the red was to the right of the blue. Tables 13 and 14 show some of the results.



TABLE 13: *Reaction Times for Discriminating between Colors*

COLORS	TIME REQUIRED TO DISCRIMINATE
White vs. black	.197 second
Red vs. green	.203 second
Red vs. blue	.212 second
Red vs. yellow	.217 second
Red vs. orange (mixed with 25% red)	.251 second
Red vs. orange (mixed with 75% red)	.271 second

Notice that those colors nearest each other require the longest time to discriminate. The colors of the spectrum run in this order: red, orange, yellow, green, blue, violet. By the time we come to violet, we are practically back to red. Red and green are about as far apart as two colors can be. They are more quickly discriminated than any others. White and black are not true colors.

This same investigator obtained similar results with experiments in which the time required to discriminate lengths of short lines was measured.

TABLE 14: *Reaction Times for Discriminating between Short Lines of Different Lengths*

LENGTHS	TIME REQUIRED
10 millimeters vs. 13 millimeters	.296 second
10 millimeters vs. 12 millimeters	.305 second
10 millimeters vs. 11.5 millimeters	.313 second
10 millimeters vs. 11 millimeters	.324 second
10 millimeters vs. 10.5 millimeters	.345 second

The data show that here too stimuli which are nearly alike are discriminated more slowly than those which are less alike.

*The effect of high altitude.* Quick reaction time is an important characteristic of the good airplane pilot. He is often called upon to "do something and do it quickly." Slowness may lead to injury or death. One of the obstacles to altitude flying is that low oxygen pressure at high altitudes slows the pilot's reaction time. That low oxygen pressure continues to have this effect as long as one stays in it is shown by the fact that residents in the Andes have slow reaction time.<sup>24</sup>

*Body temperature and reaction time.* Kleitman found reaction time to be less when the temperature of the body is high from natural causes than when the temperature is low.<sup>25</sup>

*The effect of coffee on reaction time.* Coffee and certain soft drinks contain a stimulant, caffeine. This drug speeds up the reaction time temporarily.<sup>26</sup>

*How accurately can we observe and report?*

Errors of observation and report result from many causes. These errors can be classified into four headings: (1) errors due to momentary lapses of attention; (2) errors due to permanent defects of the sensory equipment; (3) errors in the process of interpretation of the sensory data; (4) errors brought about by faulty memory if the report is sufficiently delayed.

*How false testimony arises.* In the middle of a no more than usually dull lecture, just as the lecturer was pointing to an exposure apparatus which showed a large card bearing the letters NIZ, an excited individual clad in a white laboratory gown burst into the classroom by the east door, shouting, "Did you take my memory apparatus?"

*Lecturer:* "Yes. I need it for a demonstration."

*Stranger:* "You can't have it. I have a subject waiting. I need the apparatus for my research."

*Lecturer (with dignity):* "Kindly wait until the end of the hour and then you may have the apparatus."

*Stranger (loudly):* "I want it right now, and I am going to have it."

*Lecturer (angry and shouting):* "You'll leave that apparatus alone if you know what is good for you."

*Stranger (very angry):* "You'll give me that apparatus if you know what's good for you. I'm going to the Chief."

*Lecturer (through clenched teeth):* "Please leave this room."

*Stranger:* "If I do, this goes with me." (*He seizes apparatus and throws it on the floor, scattering cards in many directions. Leaves by the east door.*)

By the time the above dispute was well under way, the students were paying close attention. Some showed clearly their feelings of distaste toward the childish behavior of the two adults.

After order was restored, the lecturer explained that he and the visitor were really good friends and that the whole thing was prearranged to test the abilities of the class to observe and report with accuracy a simple incident. Mimeographed sheets containing questions as to what had happened were distributed, and the stu-

dents were asked to answer them to the best of their knowledge. Under these conditions we would expect the accuracy of report to be at its highest. In the first place, the students were already looking at the lecturer's platform; secondly, they were asked to give their reports immediately and before talking with anybody; thirdly, the printed blanks served to help them organize their memories of the situation; fourthly, the situation was not one to provoke strong emotion, which can so easily upset our ability to observe. In spite of these factors favorable to accurate observation, the results were extremely inaccurate. A total of seventeen questions was asked. No student answered all of them correctly.

(1) *At what time did the stranger enter the room?* (He had entered the room at 9:30 A. M., just as the clock struck.) Despite this aid, the estimates of the time varied from 9:20 to 9:43. A difference of twenty-three minutes might easily mean an alibi in a criminal trial.

(2) *What was the color of the stranger's necktie?* (He wore none.) Out of a group of 97 students 51 refused to answer, 17 said that he wore none, 29 named the color of the non-existent tie. The colors mentioned were tan, brown, green, gray, red, blue, black, and dark. Undoubtedly the form of the question was responsible for the great inaccuracy in reporting this fact. Questions so worded as to suggest an incorrect answer are called "leading questions," and are sometimes used by unscrupulous lawyers to obtain false testimony from honest but naïve witnesses.

(3) *Did the stranger's companion enter by the east door or by the west door?* (There was no companion.) This is another type of leading question which is effective, because in suggesting two alternatives it has the air of authenticity. The results are tabulated as follows:

East door.....	51
West door.....	5
No answer.....	13
No companion.....	28
<i>Total.....</i>	<i>97</i>

You will remember that the stranger came in alone by the east door and left the same way. Now, suppose that the observer had no memory of the companion. The form of the question in assuming that there was a companion would probably cause the observer to reason like this: "The companion *must* have come in by the east door if he was with the stranger." Thus is inference substituted for observation.

(4) *What nonsense syllable was in the apparatus?* This was a straightforward question with no attempt to lead the answer. The results here were gratifying. Seventy-eight students gave the syllable NIZ correctly. This indicates that meaningless facts can be accurately observed if the attention is directed to them. The students quite naturally thought that the nonsense syllable was to play a rôle in the demonstration and noted it carefully before their attention was attracted to something else.

In the illustration above, many sources of error combined to account for the faulty observations made by the students. Most of the errors are to be attributed to poor attention, however. The students were poor observers, because they "didn't know what they were supposed to see." Observation errors of this type can be greatly reduced by training. An important part of this training consists in making a definite schedule of points to be looked for. Policemen are decidedly better than others of their same general intelligence in ability to observe, because they practice intensively for their tasks.

*How advertising influences our reported observations.* You will remember the fable of the queen who sent two of her brave knights to search for certain plants growing in her land. One of the knights was told to find as many poisonous weeds as he could; the other was instructed to return with samples of each of the beautiful flowers to be found. When the two knights returned, each was questioned as to other plants which might be growing in the kingdom. The knight who was sent to gather weeds had seen no flowers; the knight who had been sent to gather flowers had seen no weeds. There is a fundamental psychological truth underlying this fable. We see what we are looking for.

Advertisers make use of this fact in building up in people the expectation of desirable qualities in the product which the manufacturer has for sale. Some of the best illustrations of this are found in the field of cigarette advertising. The manufacturers of the popular brands of cigarettes make distinctive claims for their products. Habitual smokers profess to have deep-seated preferences for one or another of the brands of cigarettes on the market. How much of the preference is based on some real difference between the taste or smell of the smoke of the cigarette, and how much is purely the result of expectation built up through clever adver-

tising? To answer this question, Husband and Godfrey conducted a "blindfold test" in which habitual smokers were asked to identify the cigarettes which they sampled without knowledge of the trade name.<sup>27</sup>

The subjects in this experiment, fifty-one college students, were blindfolded and given the various cigarettes to smoke in random order. They were told that one of the cigarettes would be of the brand that they had previously announced to be their favorite. Table 15 shows how well the subjects succeeded in identifying five brands of cigarettes on the basis of taste and smell in the absence of expectation built up through advertising.

TABLE 15: *Accuracy in Identification of Different Cigarette Brands by 51 Students*

BRAND OF CIGARETTE	% CALLING IT:					
	CAMEL	LUCKY STRIKE	CHESTERFIELD	20-GRAND	SPUD	MISCELL.
Camel	31	14	38	6	2	10
Lucky Strike	19	41	21	4	0	14
Chesterfield	27	23	33	2	0	15
20-Grand	38	26	3	17	0	15
Spud	0	6	6	0	76	11

Notice that Camels were more frequently identified as Chesterfields than they were correctly labeled. The erroneous identifications of 20-Grands as Camels were over twice as frequent as their correct identifications. Chesterfields and Lucky Strikes, on the other hand, were correctly identified more frequently than they were named as any single incorrect brand. On the average the accuracy of identification for all subjects and all brands was about what would be expected by chance in the case of the non-mentholated brands. The mentholated Spuds were correctly identified about three-fourths of the time.

A group of college students were recently asked the following question, calling for a report of their observations on the flavor of two popular soft drinks.

"Which of the following soft drinks has the best flavor: Coca Cola or Royal Crown Cola?"

When a group of students expressing a preference for one of these brands was asked to pick out the unlabeled glass of their favorite of the two, the degree of success was roughly fifty per cent. This is what would occur by sheer chance. Obviously, preference was based not on actual flavor but on some other influence, presumably advertising.

### *Methods of observing and reporting in psychology*

As was suggested in Chapter 1 and as you have seen from experiments described in the intervening chapters, psychologists employ two important methods of observation in studying human beings. First is the direct observation by the individual of his own conscious states and processes, such as thinking and feeling, which go on within him. This is technically known as the *method of introspection*. The other is the *method of describing behavior*; the individual's outer behavior under various conditions is observed and described by others.

*The method of introspection.* From introspection the subject is able to furnish a report on things that go on in consciousness and which might be overlooked by any other method. The method of introspection is the only method of studying certain problems in psychology.

You can familiarize yourself with the technique of introspection by conducting the following exercise. Think of your breakfast table of this morning. Can you "see" the form of the plate from which you ate? Can you get an image of the brightness of your coffee cup? Can you call up an image of the odor of the coffee? Can you observe the auditory image of the sound of silverware against the plate? Can you get an image of the taste of your favorite breakfast food? How long do these images persist? How does the clearness of your strongest image compare with that of actual perception of the same object when it is before you? These are typical introspections.

Press against your eyeballs for several seconds. Describe what happens. Do you see flashes of light? What color are they? Do you see forms? What are they? How long do the various visual experiences last? In what order do the various experiences take place? Gaze at a bright light for a few seconds. What happens? Describe

your introspections. Wait until you are hungry and attempt to describe by introspection the varieties of conscious experience which go with that condition. Where are the sensations localized? That is, from what part of the body do they seem to come? Are they pleasant or unpleasant? Continue this process of introspection over a period of ten or fifteen minutes. How do your sensations of hunger change with the passage of time? These are other typical exercises in introspection.

With very little experience anyone can learn to perform simple introspections of the sort you have just tried, but nobody can with any amount of practice observe a sensation in somebody else. This constitutes a serious limitation of the method of introspection. Another limitation, and a very important one, is that many of the activities of man are wholly or partially unconscious and hence cannot be observed by the introspective method. Under hypnosis, as we saw in Chapter 1, certain instructions governing the activities of the subject can be given in such a manner as to become effective a few hours after the subject has regained consciousness. These instructions will usually be carried out faithfully and in detail, but the subject will be unable to account for his behavior. Such experiments, as well as observations on the behavior of abnormal and insane people, convince the psychologist that unconscious activities are of great importance in human living. Obviously, then, a psychology based entirely on introspective data would be distinctly limited. The introspective method is further restricted in that it cannot be used with animals, young children, feeble-minded persons, or adults who have not been trained in its technique. Yet such individuals are part of the material with which the psychologist works.

*The method of describing behavior.* With the method of describing behavior we observe what the individual *does*, not what he *thinks* or *feels*. The environmental conditions under which a certain act is performed are standardized in detail, permitting them to be duplicated by another worker or by the same worker at a later date. The act itself is also described in detail. Complicated apparatus such as that described for the reaction-time experiments is frequently employed to obtain graphic records of the individual's behavior. That such experiments can be made, studied, and



analyzed by several different psychologists adds greatly to the accuracy and value of the method of behavior. Of course, in the method of behavior we observe mainly that which goes on in the external world rather than in the individual himself—a serious limitation of the behavior method. On the other hand, with this method we can study animals, children, the feeble-minded, and the insane. And it is not necessary that the subject be trained in psychology. This is a great advantage, because the very training necessary in becoming a skilled introspectionist may give the subject prejudices which will influence his observations.

*Combining the two methods.* As you compare the two methods of observing human behavior, you will notice that the scope of one supplements the scope of the other. These two methods working hand in hand have made possible the recent advances in scientific psychology. Moreover, talking or writing is behavior; the recorded words of the subject can be studied. Thus, although consciousness is a personal matter, which no one but you can observe in yourself, an analysis of your reports on introspection is essentially the same as the analysis of any other form of behavior.

A good example of the combination of the behavior method with the introspective method is found in an experiment in which college students learned to trace the finger maze shown in Figure 44.<sup>28</sup> In a maze the subject attempts to follow a series of segments making up a true path without entering any blind alleys. In this case the true path and blind alleys were made of wires mounted on a smooth board to give the pattern shown. The subject was blindfolded so that vision could not be employed to guide his movements. His finger was placed on the starting-point, and the signal given to commence exploring the maze in an attempt to reach the goal. It was not "fair" to let the finger leave the wire tracks. The amount of time to reach the goal and the number of entries into the "blinds" were recorded for each trial. The best learner was the individual who could learn the maze to the point of several successive repetitions without error, in the shortest time and with the fewest total errors. Thus in determining the best learner the method of observing behavior was employed. As the subjects learned, they were asked to observe how they learned. The majority of the subjects translated the maze into words—the so-

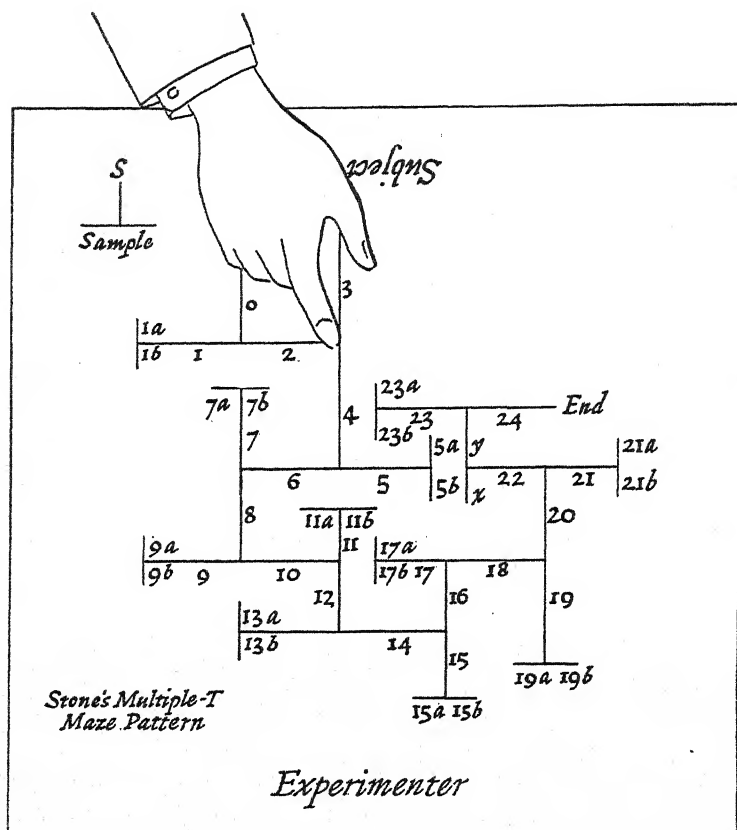


FIGURE 44. Clearly the high relief finger maze lends itself, through a combination of behavior method and method of self-observation to an understanding of how people learn.

called verbal method of learning. Such individuals would say to themselves as they traversed the maze: "First you go ahead, then to the right, then ahead, then to the left," etc. Such subjects simply memorized the directions as one would a poem or speech. Other subjects attempted to get a picture of the maze pattern in the "mind's eye." These were called the visual group. The third group attempted to learn the maze by the "feel" of their fingers and arms. These were called the motor (muscle sense) group. It is interesting to note the average performances of the three groups. As will be seen from Table 16, the verbal method was obviously the most efficient of the three.

TABLE 16: *Average Performances of Three Groups (Using Different Methods) in Traversing a Maze*

METHOD	NUMBER USING	TRIALS TO LEARN
Verbal	29	19.5
Visual	4	24.3
Motor	10	44.5

Thus we see that the psychologists have two fundamental ways of studying human nature. They can look inwardly and describe what goes on within themselves when certain external or internal stimulating conditions are at work. This is the method of introspection. The other method, that of behavior observation, records our direct observation of people's external activities. As you have seen, each of these methods has its advantages and limitations, but the two methods when used together give a more nearly complete description than either alone.



In order to remain alive, man must adjust to both his social environment and his physical one. Good adjustment requires accurate and quick observation; observation consists of attention and perception. Attention is a process of adjustment of the body and its sense organs to select certain stimuli from the complex stimulus pattern which is present at any time. Attention prepares for perception by selecting certain groups of stimuli and ignoring others. On the introspective side, attention may be defined as increased clearness in consciousness. The complex of sensations to which we attend seems more vivid than other sensations to which we are not attending. Through perception the relationships among sensations are discovered. Perception is essentially a process in which the stimuli afforded by physically present objects are organized into a meaningful whole, usually with the aid of past experience.

Attention and perception fluctuate. The same object may be differently perceived at two different times. This fact has a biological advantage in life situations because through changes in the way of perceiving an object or situation the individual is given suggested solutions to problems which confront him.

The process of observing is subject to many errors. The impor-

tant thing is to know that errors are to be expected in observation and to allow a margin of safety in acting on the basis of our observations. The speed with which people can perceive depends upon many conditions—the nature of the sense organ; the strength of the stimulus; the nature of the fore-period; the amount of practice the subject has had; the complexity of the reaction. Reaction time, obviously, has a number of practical implications.

We have no special sense organ for the perception of time. The passage of time is inferred indirectly from events which come to us through any sense organ. Just how people perceive the passage of short intervals is not well understood, although it seems to be related to the speed at which life activities go on. Longer intervals are perceived through changes in bodily condition which accompany them. Children are very poor in ability to perceive time.

Psychologists use two methods of observing human reactions—the method of describing behavior and the method of introspection. Behavior observation records our direct observation of people's external activities. Introspection describes what goes on within oneself.

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Figure 37 represents a soldier and his dog marching past an opening in a board fence.

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### *Recommended Readings*

BARTLETT, F. C. *The Problem of Noise*. Macmillan, 1934.

The effects of noise on human efficiency.

COOVER, J. E. *Experiments in Psychical Research*. Stanford University Press, 1917.

Reports years of careful research yielding no evidence for psychic phenomena.

MÜNSTERBERG, H. *On the Witness Stand*. Boardman, 1927.

The errors that eye-witnesses make are marched in review.

PRATT, J. G., *et al.* *Extra-Sensory Perception after Sixty Years*. Henry Holt and Company, 1940.

Read this and Coover side by side.

VERNON, M. D. *Visual Perception*. Macmillan, 1937.

The development of perception and the factors influencing it.

*"He who has no inclination to learn more, will be  
very apt to think that he knows enough."* POWELL

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## CHAPTER 9

# LEARNING

*Learning is the grindstone that sharpens the tools of inherited ability.  
Through learning people become alike in some things, different in others.  
How motives and opportunity guide our learning from the cradle to the  
grave.*

WITHOUT LEARNING, man would be a creature capable only of reflex action. Such an individual would be unable to talk or walk; to feed or dress himself; to drive an automobile or play the simplest game. He would be more helpless than the dumbest animal. A human being who had learned absolutely nothing would be capable of living only if cared for by others. Learning, like motivation, is all-pervasive. It is probably impossible to pick out a single human act above the reflex level that has not been modified in some important way through learning.

Learning makes man the master of the situation. Man is less dependent upon his environment than other animals which do not possess his ability to learn. Naturalists have described the complex social life of bees and ants. Insect societies are known in which

there is a strict division of labor; that is, certain individuals are workers, others are soldiers, others are specialized in the task of perpetuating the race. How, then, does this complex insect society differ from that of man?

One of the most important differences is man's ability to learn. Through learning, man becomes less dependent upon his environment than are other animals, learning to rise above it and modify it to fit his own needs. Man has learned how to protect himself from extremes of temperature and through techniques of forecasting the future is able to prepare himself in advance to meet anticipated changes in his physical environment. He has learned how to develop the natural resources of the earth through complex application of science. The bee and the ant lack this capacity to learn. Their reactive equipment is limited to a certain inventory of reflexes and instincts, and they are highly dependent for their continued existence on an unchanging physical environment.

So important is the learning process in the life of man that one of our largest professional groups is charged with the task of fostering learning—the teaching profession. Learning, however, is not limited to formal education. Nor, in fact, is learning divorced from our leisure activities and recreation. Much of our learning comes from school activities and books, but there is still an important amount of learning acquired through contact with the radio, the theater, the motion picture, advertising, museums, and public lectures.

If times and conditions did not change, the necessity for learning would cease to exist, once an adequate stock of habits and skills had been acquired. The facts of the matter are, however, that any occupation, whether it be a trade, a profession, or some branch of business, requires that the individual continue to learn if he is to be successful in meeting the ever-changing conditions governing any occupation. The manufacturer of a commodity, for example, must learn what qualities and characteristics of his product the public accepts; what qualities and characteristics detract from public acceptance. Knowing what the public wants, his next step is to see that his product possesses those qualities; then he must learn how best to advertise the superior value of his product.

The mechanic is not through learning when he has completed his apprenticeship, nor, in fact, when he has taken and passed successfully all of the tests necessary to admit him to the rank of master mechanic. New discoveries are constantly being made which change practice in every trade. The expert mechanic, to be truly expert, must keep up with these changes—he must learn.

Learning begins in full force at birth. You have seen from your study of Chapter 2 that some learning is possible even before birth. The emotional habits which we learn in early childhood or in infancy may help or hinder us throughout our entire lives. Youth is the Golden Age of learning, although the joy of learning is not denied the aged.

### *Conditions Necessary for Learning*

BECAUSE LEARNING is one of the most common and most important of all the things we do, it has probably received more attention from modern psychology than any other phase of human behavior. From this study psychologists have learned much. In this section you will examine the conditions under which learning will occur.

#### *Learning depends upon motivation*

It is not necessary to conduct laboratory experiments to show the importance of motivation in learning. The close relationship between motivation and learning is apparent on ordinary observation, although the finer details of their complex relationship cannot be ascertained by such observation. The connection between learning and motivation has been investigated very thoroughly in the case of animals but less well in human beings because of the greater difficulty of controlling the secondary, or conditioned, drives of man. Theoretically, at least, it is quite clear that learning will not occur in the absence of a motive. Although we have never been able to arrange conditions so that the subject is still awake but not motivated in any way, it is possible to approach this limit and to observe how the speed of learning decreases as the strength of the motivation is decreased. Speed of learning is one of the best criteria of the strength of motivation.



Let us examine a simple case of learning as seen in the behavior of a human baby the first few times he becomes hungry. Prior to birth the baby's food has been supplied by the maternal circulation. Sometime near the end of the infant's first day of life his organism shows signs of having used up his surplus supply. What are these signs? The baby cries, kicks, and waves his tiny arms helplessly. He opens and closes his mouth. This is the picture of hunger and thirst motivation in the new-born.

When the baby's first feeding is given, he does not at once draw properly on the mother's nipple or on the bottle. In some cases it is even necessary to introduce the milk into the baby's mouth by mechanical means. As the days pass, there is maturation and learning until finally the baby can make the necessary sucking movements when the food source is placed in his mouth. We now notice also that the food-taking activities dominate the picture in hunger and that the useless movements have become subordinate. The older the individual becomes, the more appropriate his behavior becomes. Eventually all waste movements are eliminated; only those movements remain which serve in satisfying the hunger drive. Before the baby is old enough to walk about, he will reach for his bottle; when older, he will search the pantry for jam.

Psychologists have been studying the learning behavior of animals, babies, children, and adults for more than half a century. Their more important findings on the relationship between motivation and learning may be summarized under the following six principles, all of which can be applied in your own daily learning or used to advantage in helping another person learn.

- 1 The principle of satisfaction. A behavior sequence terminates with the attainment of an object capable of satisfying a drive. The object which satisfies can be some physiologically needed substance, such as food or water, or it can be an object which has acquired a symbolic or secondary reward value by having in the past been associated with the object which is capable of supplying physiological relief. In the absence of such satisfaction we usually find little or no learning. The application of this point to college life is clear. The student who comes to, and remains in, college against his will cannot expect to profit nearly so much from the opportunity for learning as the one who comes to college

because he is eager to acquire more education as preparation for the earning of a living or as a means of understanding and enjoying life to the fullest.

A. Latent learning. In most learning situations the motive for learning and the progress of learning are obvious or may be detected. Hence, the problem of whether or not learning can take place in the complete absence of motivation may be a purely philosophical one. When a human being is alive, there is probably some drive acting.

Blodgett used the maze to study the possibility of learning without motivation.<sup>1</sup> During the first nine days of the experiments the hungry rats were not fed upon completing the task of getting through the maze. They showed few signs of learning to go to the exit of the maze, often entering blind alleys, resting, retracing their paths, and making but little reduction in the amount of time required to get through the maze. In all probability the satisfaction resulting from escape from the maze was less than that derived from exploring the maze. Exploration is characteristic of the hungry rat when in an unfamiliar situation that contains no food. On the tenth day they found food at the exit of the maze. Their performance on the eleventh day was entirely different. The rats raced through the maze in a very few seconds, entered few blind alleys and did little back-tracking. In fact, their behavior was scarcely different from that of a control group which had been fed at the end of each daily run every day for ten days. Apparently there was some latent learning which the introduction of a reward made apparent. The question is whether there was learning without drive. Here again is a difficulty of interpretation. Perhaps the exploratory drive was at work strongly enough to produce learning which became apparent when the hunger drive and food-reward situation were set up. There is some experimental evidence to support this explanation.

Leeper conducted an experiment in which he found that rats could be trained to choose one path when hungry and another when thirsty in the same external situation.<sup>2</sup> Apparently drives function both to influence formation of habits and to call them forth when the situation seems to require them.

A more recent experiment by Herb gives further weight to this

function of motivation.<sup>3</sup> Several rats were permitted to run through a maze but were not rewarded (except as the exploratory drive might have been rewarded).

After six days the animals were divided into two groups. Group I ran the maze once a day but was not given food at the end. Its only reward was the relatively weak one of escape from the maze. Group II found food in each blind alley every day. These animals received no other food.

The rats of Group II entered the blind alleys with increasing frequency over the ten-day period; the other group entered fewer and fewer times. Starting on the eleventh day the rats of Group I found food in each alley. On the twelfth day and thereafter they entered the blind alleys as frequently as Group II. Apparently these rats knew where the alleys were but entered them only when the reward was there.

Drives obviously cause a latent habit to function when the situation requires the use of that habit. This is true of rats and men.

B. Unconscious learning. Learning can occur when the human subject is not conscious of the external stimuli to which he is reacting. Miller performed a clever experiment to study the effects of changed motivation upon the curve of acquisition of skill in discriminating between subliminal stimuli.<sup>4</sup> The four subjects were told that the experiment was one on clairvoyance. The apparatus was arranged so that reflections of ESP cards (p. 274) could be projected on a mirror surface at different intensities. In Series I, with an intensity of illumination well below the threshold, four naïve subjects gave chance results and reported boredom and frustration at their performance, when informed of the correctness of their responses. In Series II the intensity of illumination was increased to a point just below the threshold, and an occasional card was presented with illumination well above the threshold in order to encourage the subjects. They remained unaware that they were reacting to physical stimuli even when the illumination was well above the threshold. In Series III, with illumination well below threshold level, the four subjects were paid five cents for each correct report and fined five cents for each

wrong report. In Series IV, the subjects were punished by a shock and rewarded by praise for wrong and right responses. It was found that visual discrimination can be made to improve without the subjects' being aware of the stimuli to which they are reacting and that the relative effects of increased motivation for such learning are comparable to those for learning with awareness.

Nothing in the preceding discussion proves or disproves that learning can occur in the absence of rewarded drive. There is no clear evidence of learning having occurred in the absence of motivation. There is no doubt that it can occur in the presence of rewarded drive even though the subjects are unconscious of the stimuli to which they are learning to react.

Within limits the more drives that are satisfied by a particular successful response or the greater the strength of a single drive satisfied, the greater the effectiveness in producing learning. Rats that are hungry and thirsty will learn to find the exit of a maze faster when both food and water are found at the exit. Men will learn better when money and honor reward them than when money alone is the reward. A college student will work harder in a course which is obviously useful than he will in one which rewards him with nothing more desirable than mere credit hours.

The rigorous exposition of the experimental basis of this principle would take the student far beyond the scope of an elementary textbook. One example, selected from the field of human learning, must suffice.

Kitson studied the effect of giving to printers, in addition to the basic salary, a special wage bonus, the amount of which depended upon the amount of work done.<sup>5</sup> The printers were already receiving good pay and were regarded by their employers as "doing an honest day's work." Immediately after the added motivation was applied, the curves of production started to increase. The men used their old habits of work at a more rapid rate and in addition learned new ones. This improvement lasted week after week, for several months in some cases. At the end of the experiment the men as a whole were doing nearly twice as many units of work as they had been at the beginning. The younger men showed greater improvement than did the older ones. This is probably

because money meant more to the younger ones, whose lives were still ahead of them and who might have been dreaming of business opportunities made possible by the extra earnings. Moreover, the older men were set in their habits and attitudes to such an extent that changes in methods of work did not come quite so easily.

2 *The principle of punishment. Everything else constant, a response which leads to punishment tends to be eliminated and replaced by one which leads to reward.* This law is well illustrated by the experiments of Bunch, who had groups of college students learn to trace with a metal pencil or stylus a maze consisting of a series of passages with numerous turns and blind alleys.<sup>6</sup> The object was to get through the maze without any lost motion and as quickly as possible. Each entrance into a blind alley was counted as an error. Some subjects received a sizable electric shock when the stylus entered a blind alley, while others did not. The end result was that those subjects who received shocks for errors learned more quickly to avoid the incorrect response than did the others. (Part of the superiority of the groups shocked for wrong responses was probably due to the fact that the shock served to tell them the location of the blind alley.)

3 *The principle of immediacy of reward or punishment. Everything else constant, the sooner the reward follows upon the "right" act, the greater the tendency of that act to be repeated the next time; and, conversely, the sooner the punishment is applied after the execution of the "wrong" act, the less the tendency for that act to be repeated the next time.*

Lorge and Thorndike have studied the effects of withholding knowledge of the accuracy of a response for different periods of time up to six seconds.<sup>7</sup> Educated adult subjects tossed balls back over their heads at an unseen target. The results of the throw were announced to the subjects one, two, four, or six seconds after the throw or not at all. With the longer delays the rate of improvement in accuracy was slower than when the results were announced to the subject one or two seconds after the throw was completed.

Punishment or reward should be immediate to get the best effect.

④ *The principle of symbolic drive, reward, and punishment. A symbol can through previous association with the real reward or punishment acquire motivating value.* This discussion is also familiar to you from your study of Chapter 3. The substitution of symbols for a motivating stimulus and also for reward is a fundamental fact of human behavior and must not be overlooked. We see examples every day in the efficacy of a mother's praise or blame and in the effectiveness of verbal commands.

Thorndike, Tilton, and many others have conducted experiments to determine whether rewarding or punishing subjects symbolically by saying "right" or "wrong" as they made the correct or incorrect response would affect their percentage of error.<sup>8,9</sup> In one experiment, the subjects were given a word and told to say any number from one to six. Following the subject's reply, the experimenter said "right" or "wrong." In a later test the subjects repeated the "right" connections far more often than they should have by chance and the "wrong" ones far less frequently. The words right and wrong are two of the most important motivating symbols in our lives.

⑤ *The principle of interest. The more interesting the material to be learned, the more easily it will be learned.* The factor of interest is very closely related in nature to that of symbolic drive and reward, on the one hand, to that of "belonging" on the other (p. 300).

In the process of growing up we establish goals toward which we strive. The nature of these goals will depend upon how we have been trained or conditioned by our parents and by the society and culture in which we live. Some of us strive to outdo the other person; some of us strive to serve the other person. Most of us have before us the central aim of making a living through business or professional activity. Subject-matter which relates to one of these goals, which brings us closer to its attainment, is more interesting than subject-matter which is quite unrelated to our ambitions or needs.

In an elaborate study of students' interests and attitudes in relation to academic success, Crawford found that those students who had definitely decided upon their life work received higher marks than those who had made no choice of vocation.<sup>10</sup> The superiority

of the scholarship of the vocationally oriented students remained when the factor of intelligence was ruled out by a statistical procedure. Crawford also found that the degree of definiteness in vocational orientation was closely related to the degree of success in study. Students who were definitely training for the ministry or for teaching excelled those who were planning upon entering some unspecified sort of business as a life work.

According to the Crawford study, students do their best work in elective courses rather than in required ones. Here again we find evidence of the importance of interest in determining achievement in college studies.

Factors of this sort are slowly shaping educational policy in the lower schools as well as at the college level. There is today a distinct tendency away from required courses combined with an attempt to capitalize upon student interests in preparing lecture-course content and in writing textbooks.

Subject-matter need not relate only to vocational plans to be high in interest. Certain items of information are useful to anybody, regardless of how he earns his living. For example, the material in psychology which relates to a student's own personality adjustments is far more interesting to him than material of a more academic or less personal nature.

The principle of belonging. You have learned from your study of observation in the preceding chapter that a part of a complex situation may be seen in several different ways, depending upon how the total situation is perceived. A similar phenomenon is found in learning. Thorndike has brought out this fact very clearly in a series of experiments of which the following is a typical example.<sup>11</sup>

Learners listened to ten repetitions of a list of sentences. The sentences were always in the same order. Two examples follow:

Norman Foster and his mother bought much.

Alice Hanson and her teacher came yesterday.

Notice that the expression "*Norman Foster and his mother*" was followed exactly ten times by the expression "*bought much*" and that the expression "*bought much*" was followed exactly the same number of times by the words "*Alice Hanson.*"



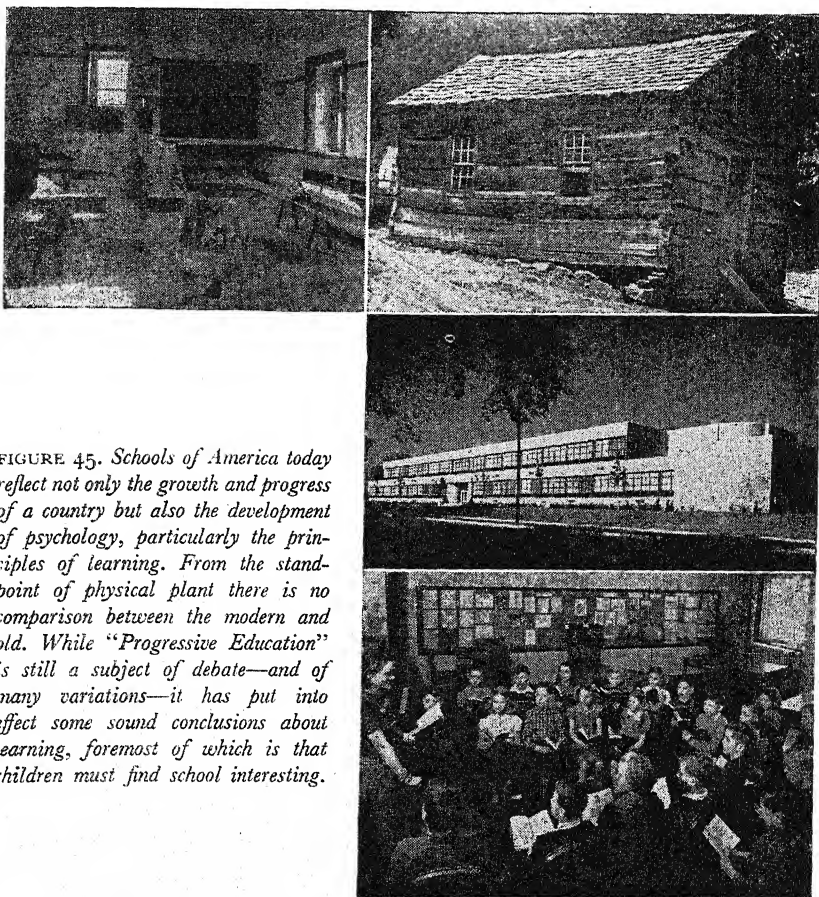


FIGURE 45. *Schools of America today reflect not only the growth and progress of a country but also the development of psychology, particularly the principles of learning. From the standpoint of physical plant there is no comparison between the modern and old. While "Progressive Education" is still a subject of debate—and of many variations—it has put into effect some sound conclusions about learning, foremost of which is that children must find school interesting.*

Immediately following the ten repetitions the subjects were tested to see what "connections" had been formed. The test consisted in giving the subjects several words as a stimulus and asking them to respond with the words that came immediately after in the original text. The stimulus "*Norman Foster and his mother*" called up the response "*bought*" with 81 per cent of the subjects. The words "*bought much,*" however, called up the words "*Alice Hanson*" with only 2.7 per cent of the subjects. Since the factor of repetition was constant for the two sequences, we must conclude that a given number of repetitions will produce considerably more learning when the factor of belonging operates than when it doesn't.

The implications of the results of Thorndike's experiment for teaching and learning are obvious. When you encounter a new fact in your study, ask yourself where that fact belongs. What issue does it clarify? How can you put it to work? What other facts belong with it? If you are attempting to show somebody else how to do a thing or if you are trying to make somebody understand a problem, be sure to present together those facts which belong together. Present the details as belonging to a principle or generalization.

Learning to deal with words always involves some use of the factor of belonging. This point has been greatly emphasized by the Gestalt school of psychologists. Gestaltists emphasize the fact that any element of behavior or experience is integrated with, or incorporated in, a large pattern. They believe that elementary behavior or experience has a meaning or significance in terms of the past experience or present condition of the individual. Isolated items which do not readily lend themselves to organization into a meaningful whole are very difficult to learn. Wheeler, a well-known American follower of the Gestalt school, reports an interesting experiment in which he asked a subject to memorize the following three lists of words.<sup>12</sup>

TABLE 17: *Differences in Time Required to Learn Three Different Lists*

LIST I (6 MIN. TO LEARN)	LIST II (2 MIN. TO LEARN)	LIST III (15 SEC. TO LEARN)
gub	cow	room
tej	sun	floor
soh	fir	wall
biq	pet	ceiling
maf	tan	door
cug	boy	window
por	lip	chair
vel	tub	table
zix	red	couch
yan	has	pillow

The subject required about six minutes to learn list I; two minutes to learn list II; and fifteen seconds to learn list III. Obviously the third list was much easier to learn. Why should this be? The introspective reports of the subject showed that the

words in the third list were much easier to organize as related parts of a unified whole, i.e., things-in-a-house. The difficulty with the nonsense syllables in the first list was that such a whole was lacking; there was no one "principle" to which the elements to be learned belonged. The older psychologists have long recognized that meaning makes for easy learning and permanent retention, but the Gestalt school has given it greater emphasis and more systematic investigation.

### ⑦ *Learning depends upon exercise*

An individual motivated in a certain way will remain active until the obstacles in the way of satisfaction of his drives have been overcome. If we continue to place the organism in the same situation every time he is motivated, he does a little better each time than he did the time before. The effectiveness of exercise involves two fundamental principles.

1. The principle of frequency. Everything else constant, the more often a response is repeated, the greater the tendency for that response to take place the next time the individual is put in a situation calling for it. This fact is at the basis of the time-honored practice of drill in the learning of spelling, arithmetic, and the other common branches of knowledge.

2. The principle of recency. The response which has been exercised and rewarded most recently is the one which is most likely to occur when the organism is in a given situation. The factor of recency is fundamental in learning situations. It is possible, however, to set up conditions in such a way that the most recently exercised response does not occur. For example, suppose that a response which is usually rewarded is punished instead. Under these circumstances some other response is likely to take place the next time, despite the force of previous repetitions. This observation does not constitute any serious criticism of the principle of recency. Leave the rewarding of a drive out of the picture, and recency and frequency have no significance. It is impossible to dissociate motivation from exercise, for the two must work together to produce learning.

Dunlap has developed a technique for the breaking of habits which might at first seem to run counter to the principle of fre-

quency of exercise as a determiner of learning,<sup>13</sup> but which really adds evidence in favor of this principle.

Dunlap at one time found himself making a persistent and annoying error in typing. When he tried to write the word *the*, the inevitable result was *hte*. Correcting the error each time and saying it over correctly to himself did not seem to help. The moment his attention lapsed, as it should in good typing, the old error was made again. One day he seized a sheet of paper, put it in his machine, and typed time after time, *hte*, saying, "This is wrong"; *hte*, "I will not write it this way again"; *hte*, etc. He was pleased to find subsequently that practicing the bad habit with intent to stop it had actually stopped the habit.

Dunlap was so gratified with the results that he applied his method to helping others overcome undesirable habits, such as stuttering, nail-biting, and thumb-sucking. Stutterers were required to stutter voluntarily in saying the words and phrases which had given the most trouble. After a subject learned to stutter voluntarily, *but not before then*, he was asked to repeat the words without stuttering. In the case of stuttering, the procedure is a rather long one, but it has been used successfully by Dunlap and several other psychologists. The reader is, however, not advised to attempt to treat a bad habit in this manner without going to a trained clinical psychologist for guidance.

There is really nothing inconsistent between the principles of learning which have just been set down and the Dunlap method. To make yourself do something when you don't want to is essentially punishment. In other words, the Dunlap technique results in punishing the undesirable act. There is, however, more to it than mere punishment. Many bad habits, perhaps *all* bad habits recognized as such, involve the arousal of some emotion when they are executed. This emotion, in turn, interferes with learning or with unlearning. The Dunlap method gets the person used to the emotion by frequent practice of the bad habit which brings about the emotion. In more technical terms, experimental extinction of the emotional response will occur when the Dunlap procedure is followed. The "error" ceases to be a conditioned stimulus to the emotional response. All in all, the method is consistent with the principles of learning under consideration.

### *Summary of the principles of learning*

We have seen that ordinarily learning is not apparent unless the individual is motivated to reach a certain goal. This goal can be the object which serves to satisfy some physiological drive, or it may be merely the attainment of some situation possessing secondary or symbolic reward value.

When a motivated animal starts to move about, the factors of exercise come into play. Frequency and recency must in the long run and in the typical case favor the successful response. The successful response must always be made if the goal is to be reached; whereas any given unsuccessful response may or may not be made during a given trial. The successful response completes the behavior sequence because it supplies the reward. For this reason the successful response always comes last and is accordingly favored by recency.

### *Kinds of Learning*

ANY ATTEMPT to divide the field of learning into parts must in our present state of knowledge be arbitrary. Is there a general factor of learning ability? That is to say, does the individual who learns one thing rapidly tend to learn another type of material equally rapidly? If a large number of subjects learned a large number of tasks and if it were found that the rank order of ability of the individual was the same for all tasks, then we could say that there is but one kind of learning. The evidence, however, is inconclusive, and we must be content to indicate certain logical divisions of the field of learning.

#### *Sensory learning*

The development of an "ear" for music, insofar as this is possible, is an example of sensory learning. Another example is the acquisition of ability to receive dot and dash code messages in telegraphy or radio. Sensory learning can take place even when the individual is unaware of the nature of the stimuli to which he is reacting, as we have seen.

### Motor learning

Learning which involves the obvious use of the muscles of the body is called motor learning. Learning to operate a typewriter, to sew, or to play baseball are examples of motor learning.

### Verbal learning

Learning to speak a piece, learning the number combinations, much of the learning of a foreign language are verbal learning. Notice that these tasks involve the use of words. Words are produced by contractions of muscles located in the vocal apparatus. Thus, learning to speak a piece involves both verbal and motor learning. The student who has really tried to master the pronunciation of a foreign language needs no further demonstration that talking is a motor skill.

### Ideational learning

Words express ideas. When we pay attention to the meaning of verbal material, we are likely to call verbal learning ideational learning. The grammatical structure of a language represents a task for ideational learning, just as the pronunciation side is largely a matter of motor learning.

Many tasks, of course, involve two or more types of learning.

## *The Criteria of Learning*

THE CHANGE in the behavior of an individual which results from practice may be observed as one or more of the following: increased accuracy, increased speed, reduced energy cost, and decreased feelings of effort. Let us examine each of these in detail, for each represents an important definition of the end result of learning.

### *Learning is shown in greater accuracy*

The person who is learning to play golf or to speak a foreign language makes many errors in his first attempts. As practice continues, these errors become fewer and fewer and may finally dis-

appear almost completely. This reduction in the number of errors (false movements or acts) in performing a task constitutes one definition of learning.

*Learning is shown in greater speed*

As errors and waste movements are eliminated, the time required to perform a particular task decreases. This decrease in the amount of time required to perform a task constitutes another common definition of learning. The speed in performance can also be expressed as the number of units of work done per unit of time.

*Learning is shown as less energy cost*

We saw on page 264 how energy cost can be measured. Using the apparatus there described, Becker and Olsen demonstrated that the effort to learn costs appreciable energy.<sup>14</sup> They had subjects write lists of nonsense syllables under the following two conditions: (1) with intent to learn and (2) passively without trying to memorize. When the instructions to the subject were to copy the syllables passively without trying to learn them, the energy turnover was increased only about three per cent as compared with the resting value; but when the subjects tried to learn, their energy turnover was increased as much as twenty-five per cent.

The experimenters also found that with practice the energy cost of learning decreased. At the beginning of their experiments one subject learned three lists of sixteen syllables in eighteen readings with a carbon dioxide cost of 1.48 cubic centimeters per second. One month later, after much practice, the subject could learn similar lists in twelve readings and with a carbon dioxide cost of 1.38 cubic centimeters per second of learning time.

Another typical experiment employing this method of measuring the effects of practice is that of three psychologists who had a subject add columns of ten three-place numbers while wearing the mask.<sup>15</sup> As practice continued, the amount of energy consumed in a given period decreased.

The amount of energy cost is rarely used as a criterion of learning, however, because of the complexity of the apparatus required.



### *Learning is shown by decreased feeling of effort*

During the first stages of learning a complex skill we are often conscious, usually painfully so, of each detail of the act to be performed. As learning progresses, the amount of consciousness accompanying the performance of the act decreases; introspection reveals, likewise, that fewer sensations of strain are experienced. Learning to skate is a good example. The skilled skater can skate as automatically as the ordinary person walks. He can even read a newspaper as he skates along and do so without disastrous consequences as long as there is no object in range with which he might collide.

### *Recording the Progress of Learning*

THE FOLLOWING figures show the number of stimulus words for which a subject was able to give the term of opposite meaning in successive periods of practice. These figures measure learning by the criterion of greater speed. Read them carefully.

165, 238, 260, 299, 335, 334, 341, 373, 390, 396, 412, 415, 448, 436, 448, 476, 498, 477, 502, 507, 526, 545, 522, 546, 557, 554.

Do you get a clear mental picture of the rate at which learning progressed? The chances are that you do not unless you have had experience in plotting curves of various sorts and are therefore able to translate the figures into a curve without going to the trouble of actually plotting them.

### *How to plot a learning curve*

A learning curve is a graphic device to show the quality of a subject's performance after successive units of practice. The unit of practice may be an interval of time. For example, at the end of the first, second, third, etc., hours of practice we might count the number of beads a person could string in a minute's time. Practice may be measured in terms of the number of trials completed or the number of articles produced. As an example of the former, a child makes five mistakes in repeating his 3's of the multiplication table after one reading. After the second reading he

makes but three mistakes; after the third, two mistakes; after the fourth, but one mistake; and after the fifth, no mistakes whatever. His results when plotted would give us a curve of learning.

To plot a learning curve you show the units of practice as distances along the base-line of your graph and the amount of work done in a given unit as a distance on the vertical axis corresponding to each trial. Figure 46 shows the data given on page 308 plotted as a learning curve.

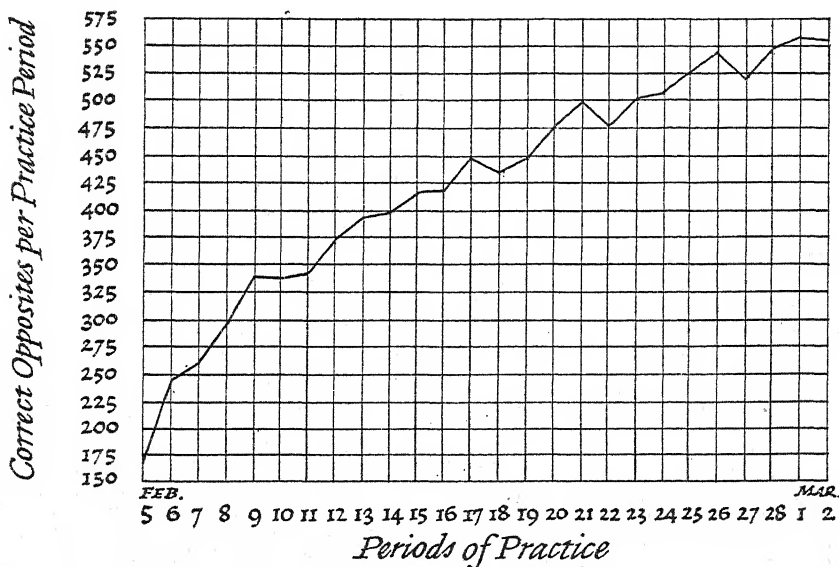


FIGURE 46. A learning curve made from data on page 308. (Adapted from Thorndike, *Adult Learning*. Macmillan, 1928.)

### *Some typical learning curves*

Many investigators have been interested in the relationship between the amount of practice and the amount of improvement yielded by each practice trial. Four typical learning curves have been found.

① The curve showing diminishing returns from practice. In some experiments it has been found that the first few trials yield an enormous amount of improvement as compared with the later ones. That is to say, each trial tends to give less improvement than

the one preceding. This diminishing of the returns from practice continues until a point is reached beyond which practice brings no more improvement. Figure 46 is a curve of this type because each trial shows less improvement than the one preceding.

② The curve showing equal returns from practice. Results of other investigations of the learning process, when plotted as a graph, have yielded uniformly accelerated curves of learning, that is, "curves" which are essentially straight lines. A trial early in the experiment yields as much improvement as one later on. Obviously the curve of equal returns from practice could not continue forever. Such a state of affairs would indicate that there is no limit to the effectiveness of practice, that practice would forever continue to bring the same improvement. When we continue learning experiments which at first appear to be giving such straight-line curves, they pass into the phase of diminishing returns.

③ The curve showing increasing returns from practice. Curves showing increasing returns from practice have very rarely been reported in the psychological literature. We are positive that the whole learning process cannot be of this type. Suppose that the returns from practice actually did continue to increase with each trial. Soon the learning curve would be shooting almost straight up, indicating an enormous amount of improvement occurring with each trial with still more coming in the next. This trend could not go on forever.

④ The complete learning curve is probably S-shaped. When we take subjects who have had no previous learning of the test material and when the material used is all of equal difficulty, we obtain a learning curve which is S-shaped, including all three of the types of curve just described. At first the learning rate increases with each trial, giving a curve showing increased returns. Then for a time the rate of learning remains constant; this section of the curve is one of equal returns from practice. Finally, there is a tapering off; less and less is learned on each new trial, and the curve becomes one of diminishing returns, rising more and more slowly and tending to flatten out entirely at the end. The three curves taken together are S-shaped. Figure 47 is a hypothetical S-shaped curve showing the three stages clearly. Figures 48 and 49 are both examples of the S-shaped curve representing the results of actual

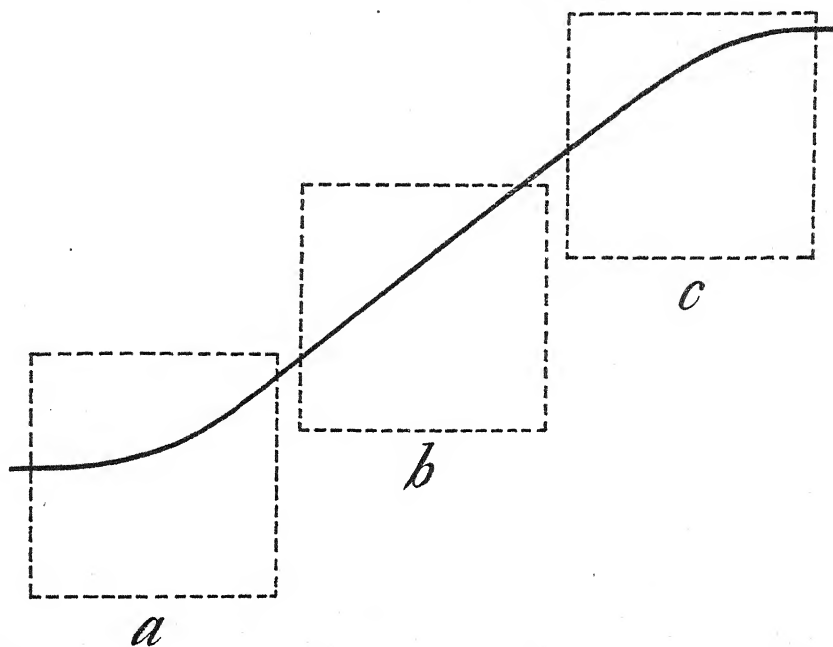


FIGURE 47. *This hypothetical curve is a composite of the three types of learning curves. (a) is a curve showing increasing returns from practice; (b) shows equal returns from practice; (c) is a curve of diminishing returns. The complete curve is S-shaped.*

learning experiments; here too you will readily see the three component parts in each case.

Figure 48 is the record made by a young child in learning the Japanese names for a number of animals. The child would look at pictures of the animals as the father read the names. After each trial the child was asked to give the Japanese name of each animal. The scores shown in the figure are the number of names correctly given in each such test. Thus we see that when all of the learning is included in the period of the experiment, an S-shaped curve is obtained.

Figure 49 shows a curve obtained in a different kind of learning, with an animal subject instead of a human one. It was found by Culler and Brogden that when dogs are conditioned to respond to an auditory stimulus the curve of learning is roughly S-shaped. Here we find further confirmation of the hypothesis that the fundamental learning curve is an S-shaped one.

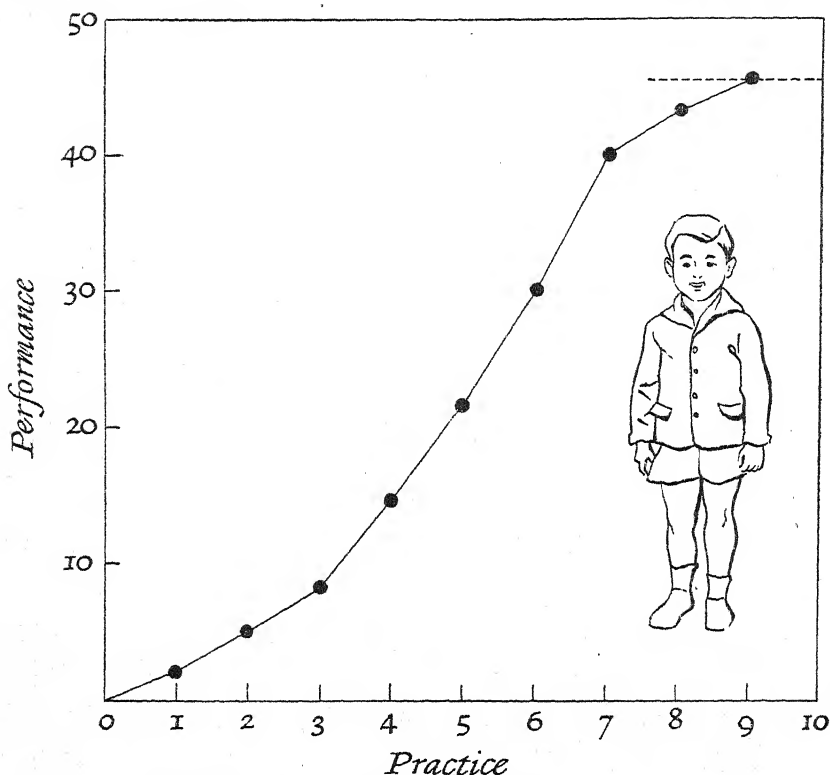


FIGURE 48. An S-shaped curve showing the learning of Japanese words by a young child. (Drawn from data of Guillet, "Retentiveness in Child and Adult." *American Journal of Psychology*, 1909, 20:318-352.)

In many if not most learning experiments the situation is complicated by the fact that much learning goes on outside of the laboratory. It is almost impossible to select a learning task with which the subject has had no experience whatever. Suppose that the task involved is that of flying an airplane. Most of the subjects will have had some practice in performing the coordinations required by this complex task. Some of them will have learned to drive an automobile or pilot a speed boat; others will have practiced rhythmical movements in dancing; still others will have judged distance while playing golf. As a result of this unrecorded prior practice, the early portion of the learning curve has already been passed when the formal experiment begins.

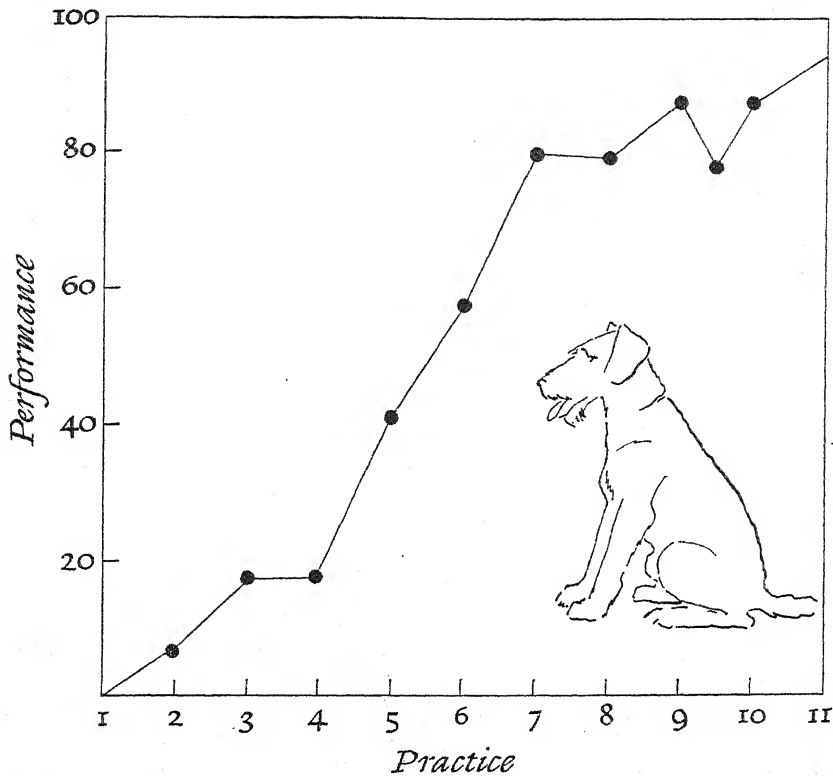


FIGURE 49. An S-shaped curve showing the rate at which a dog acquires a conditioned response. (Courtesy of Drs. Culler and Brogden of the Illinois Animal Hearing Laboratory.)

Let us consider the matter of equal difficulty. If the task to be learned contains a number of units, say a list of words, of which some are easy and some are hard, and if the scoring of progress is done in terms of the number of items which can be given at the end of each trial, the obtained curve of learning is almost certain to be one of diminishing returns. The explanation is quite simple. The easy items are put out of the way easily and speedily, while the harder ones are mastered more slowly and only after many trials. Thus we should expect to find the "normal" S-shaped curve only when the units are of equal difficulty; where this condition is not observed, the curve obtained will deviate accordingly.

The exact form of a curve of learning depends upon many other

variables too, such as the age of the subject, the nature of the material, the distribution of work and rest periods, the strength of the subject's motivation, the length of the task, etc. To summarize, there is no one curve of learning, but curves of learning taken under conditions which give the entire record and with material composed of units of equal difficulty are usually S-shaped. Some of the S's are slender, and some are fat, but they are S's. Disagreement in the past as to the form of the learning curve has probably been due to the fact that not all the factors have been taken into consideration.

### *Variations in the learning curve*

If the results of successive learning trials for any one individual are plotted to form a curve of learning, it will be seen that the curve is not entirely regular and even. In fact, we have to run the eye along the points or smooth the curve by certain statistical techniques before we can see what its trend really is.

All learning curves show chance fluctuations. Many factors contribute to this uneven performance. In one case some distraction might have been encountered just as the person was about to make a response. In another case a false movement might occur, destroying the results of the work which had gone before. Such factors contribute to a fluctuating performance and are so numerous and so little understood that we sometimes speak of the fluctuations as due to "chance."

To prevent these chance fluctuations from confusing the final result, we combine the results of a large number of subjects on the theory that they would not all be distracted at the same moment, nor would they all experience the same difficulty with a particular test. This is simply another case of the familiar statistical law that under properly controlled conditions errors balance out to reveal the fundamental trend.

Many learning curves show plateaus. The word *plateau* means flat place. Many learning curves show flat places and even dips, representing temporary cessations of learning and momentary losses in material already learned. Study the curve of learning to receive and send telegraphic messages, shown in Figure 50. Notice that there is a period starting around the sixteenth week of practice



during which little progress was made. This is a typical plateau. Then see how the learning curve shoots up rapidly after the twenty-fourth week.

There are three fundamental factors which are assumed to operate to cause plateaus in learning curves.

1. A. A plateau may be due to loss of interest. In athletics we sometimes say that a player has "gone stale." The game no longer

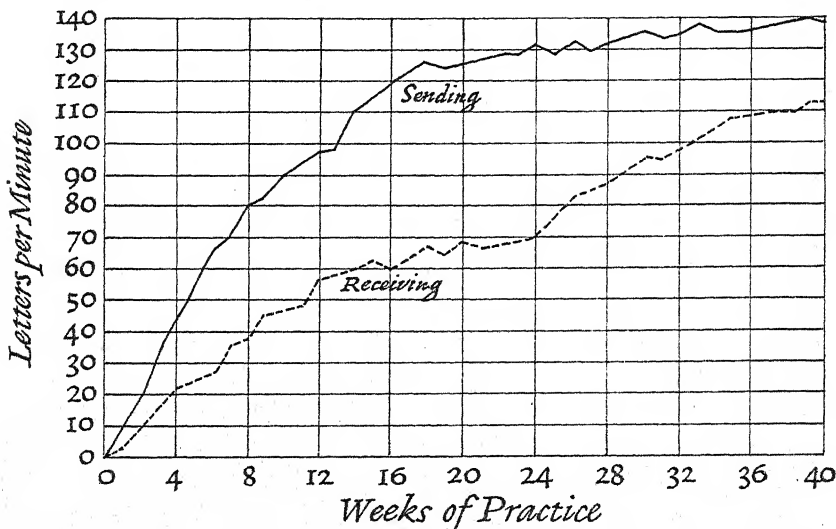


FIGURE 50. Learning curve of an apprentice telegraph operator, showing a plateau. (After Bryan and Harter.)

seems worth playing. Under these conditions of boredom practice is as likely as not to cause actual *decreases* in ability rather than increases. In such cases the wise coach tells his players to stop practicing for awhile. After a short period of no practice or of a different type of practice they come back to the original task with renewed vigor.

Notice that in Figure 50 the spurt in the curve of learning to send messages follows the apprentice's attainment of a receiving rate of seventy letters per minute, the slowest rate permitting him to operate on the main telegraph line.<sup>16</sup> This is no doubt quite an event in the life of an apprentice telegrapher, signaling as it does the end of the irksome apprenticeship. The realization that he is at last a master of his trade naturally serves to renew his

flagging interest and to bring faster improvement in its wake. Once a plateau has occurred, too, it is bound to cause further loss of interest. If our work habits are so poor that we soon cease to improve, loss of interest is almost certain to follow.

2 B. A plateau may be due to changing one's mode of attack.

Suppose that you start to learn to type without benefit of formal instruction. You will probably employ the ill-famed "hunt and peck" method. Despite the great inefficiency of this method you will eventually succeed in making pretty fair time with not too many errors. However, you will have a great deal of trouble in copying, as it is necessary with this method to keep looking from copy to keyboard and so on. All this is fatiguing, slow, and inaccurate. You have reached a plateau where you are making no further improvement. You resolve to learn the "touch" system. When you first make the transition, you find that you not only have stopped improving but have actually lost ground. Reassured by your instructor that eventually you will surpass your best performance by the old method, you keep on trying. At last you forge suddenly far ahead of where you were. The plateau is left behind.

It is possible to change one's mode of attack by increasing the size of the unit of material with which one works. In learning to type you first memorize the keyboard. This includes learning which finger is to be used to strike a certain key. When this set of habits has been firmly established, you have reached the stage of "letter habits." At this stage you spell out each letter as you write the word, thinking where each key is located. Later you are able to write simple words without paying particular attention to the individual letters in the word. Somehow the whole word seems to run off by itself, just as you take a whole step in walking without thinking of what muscle to contract next. You are now at the stage of "word habits." As time goes on, you master even higher units; you can now write whole phrases without thinking of the words individually. You are now a fair typist. Eventually you may reach the point where you can copy and carry on a conversation at the same time. Just before the student starts successfully to employ the higher unit, there is frequently a period in which improvement falls off or ceases altogether—that is, a plateau occurs. The

learner must not become discouraged by these plateaus. He should look upon them rather as signs of progress, as indications that it is time to pass on to the next higher unit. He has gone as far as he can within the frame of small-unit performance.

3 c. A plateau may be due to interference. The speed with which we learn a particular task depends upon what other activities are going on at the same time. The learning of a particular task can interfere seriously with the learning of another. Sometimes parts of the same task interfere with each other. Such phenomena will cause a plateau. It is well-known, for example, that too much practice in reading aloud will interfere with progress in learning to read silently. Likewise students are advised not to take up the study of two foreign languages at a time. It is better to learn one well before commencing the study of the other. It is very important, too, to start the study of a foreign language with the very techniques which will be used throughout the learning period. In translating German, for example, many ill-advised students try to translate each individual word into the English equivalent. This is a hampering habit because it interferes with learning to think directly in the new language. The practice of skipping to the end of a long German sentence is a bad habit of the same sort, for a skilled reader of that language takes in the meaning as he goes and does not waste time in moving the eyes back and forth.

The most common source of plateaus due to habit interference is "forced feeding." When the teacher or textbook introduces new skills or concepts too fast, there is not sufficient time for a functional mastery of each to be acquired. The result is a plateau in the learning process.

Many learning curves show no periods of retarded learning, indicating strongly that plateaus are not necessary features of the curve of learning and that it is possible to schedule your learning effort in such a fashion that no plateau will occur.

*All learning curves for motor skills show physiological limits*

Let the learner adopt the most efficient mode of attack on his task, let him work under the best conditions of motivation, let him practice and practice and practice. Despite all these favoring con-

ditions his performance in any motor task will eventually reach a point beyond which further practice will bring no further improvement. This point we call the physiological limit, since it is determined by the speed and coördination with which nerves will conduct and muscles contract. This inevitable limit will be reached because we are made of materials with limits. We find the most striking examples of physiological limit in such performances as the hundred-yard dash. Given the best coaching possible and the utmost in will to achieve, few runners have been able to run that distance in less than ten seconds, none in as little as nine.

In practical life we almost never reach our physiological limits in performance. The reasons for this are manifold. In the first place we are often content to "get by." If our performance is good enough not to arouse unfavorable comment or some other penalty, we are content. Motivation for further gain is lacking. If our methods are efficient enough to permit us to do "an honest day's work" without too much effort, we rarely worry about making them better. Industrial psychologists have found numerous examples of marked improvement over what was considered by worker and employer alike to constitute a fair daily output. In the field of bricklaying, for example, it was possible to increase the output of workers nearly 300 per cent by teaching them more efficient methods.<sup>17</sup> Kitson's experiment (p. 297), in which the printers were given an extra wage bonus for improvement over what had been considered a fair daily output, is another example of the same thing.

Another reason we seldom attain the maximum limit of performance in a particular task is that we are doing too many other things. The remarkable levels to which one can climb in the performance of a narrowly restricted skill under conditions of intensive practice are seen in the apparently impossible feats of the juggler or sleight-of-hand performer.

There is no apparent physiological limit in the learning of mathematics, physics, foreign languages, and chess. With such subjects it may even be that as we gain knowledge further learning becomes easier. When the subject-matter is rich enough or the game complex enough in its strategy, a highly intelligent person can probably continue indefinitely to learn.

## *How We Forget*

SUPPOSE that you learn the six immediate causes of the American Revolution as stated in your textbook of history. In a weekly quiz you are able to write them down in a manner which impresses the instructor as perfect. You receive full credit for that question. Suppose, however, that on the final examination you are asked the same question and can set down only four of them. You say that you have forgotten, or, in other words, you have failed to retain all of the information you possessed at the time of the quiz. Now let us notice that the term *forgetting* designates something that we infer from the person's behavior. We observe or measure the individual's original command of the subject-matter or other learned material or acts; then, after a period of time, we repeat the measurement and observe the difference. If a difference is observed, we infer that some forgetting of the original material has occurred.

### *Four ways of measuring forgetting*

There are four fundamental methods of testing the degree of memory or retention for learned materials or acts, on the basis of which we can infer the amount of forgetting. Each of these will be described briefly.

*The method of recall.* Every adult is familiar with the method of recall. Perhaps you learn two dozen new names at a party. The next day when you try to tell somebody about the party, you find that you can give only sixteen of the names. Your recall score might be stated as  $1\frac{2}{3}$  or  $66\frac{2}{3}$  per cent, although such a figure must not be regarded as having precise mathematical significance. We cannot say, for example, that a score of  $\frac{8}{24}$  or  $33\frac{1}{3}$  per cent is one-half as good as one of  $66\frac{2}{3}$  per cent. The person who recalls no names on a particular occasion has a score of  $\frac{0}{24}$  or zero per cent recall, it is true, but we cannot yet assert that forgetting has been complete; one of the other methods to be described might show very different results.

*The method of recognition.* In working with the method of recognition the subject of an experiment does not try to recall the items learned. He is given a list which contains the items he learned previously, sprinkled in a much longer list of items to

which he was not originally exposed. He is instructed to label each one recognized as belonging to the original list. His score is the percentage of items correctly recognized beyond the per cent he would get right by chance.

This method is frequently used by the police in getting identification of suspected criminals. The suspect is sandwiched in between others known to be innocent, and the witness is instructed to designate the person who has committed the crime. In this particular application of the method of recognition it is important that the chance element be made very slight by having a large group of people in the lineup who are known to be innocent.

The method of recognition always yields a numerically higher score than that of recall. We can recognize many items which we cannot recall unaided. Everyone has had the experience of trying to recall a name and failing utterly to do so until somebody suggested several, of which one was immediately recognized as correct.

The method of rearrangement. The method of rearrangement is much like that of recognition. This is a method used specifically to test memory for the order in which a series of items is presented. At the test period the items are given to the subject in scrambled order, and he is asked to rearrange them. His score is determined by the degree of correctness of the final product.

The method of relearning. The method of relearning is the most sensitive of the four methods. In this method of testing retention the subject merely relearns the original task under the original conditions. A record is kept of the number of errors made, the number of trials taken, or the amount of time consumed by the subject in relearning to the original degree of mastery. The subject's score is the difference between the amount of effort required for the original learning and that required to relearn. This difference is called the absolute savings score. The amount saved is sometimes expressed as a percentage of the original learning score. The method of relearning will often reveal some effects of prior learning when conscious recall is completely absent.

### *Forgetting is not passive decay*

Study of curves of retention makes it clear that forgetting is most rapid immediately after the end of the learning period. As

time goes on, the remaining knowledge of the material becomes more and more stable. This fundamental fact was first discovered by the German psychologist Ebbinghaus and has been verified repeatedly since.<sup>18, 19</sup> Figure 51 is a typical curve of retention.

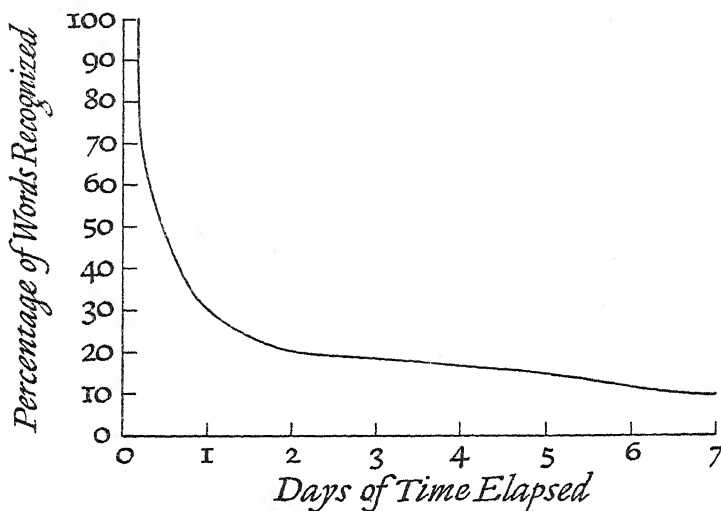


FIGURE 51. Curve of retention showing percentage of words in a list of twenty which could be recognized (after different intervals of time) as having been in the list. The list was read once. (See E. K. Strong, Jr., *Psychological Review*, 1913, 20:339-372.)

Psychologists used to regard forgetting as a passive affair dependent mainly on the lapse of time. Now we know that much more is involved.

*The phenomenon of retroactive inhibition.* Much evidence has been obtained indicating that the traces of learned activity continue to interact actively with each other and with what follows long after the time of the original learning. The effect of this interaction is interference and consequent forgetting of the original material learned. This effect is called *retroactive inhibition*.

(A. Forgetting during sleep and waking. Important evidence is the fact that learning followed by sleep does not yield the same amount of forgetting as that resulting from learning followed by activity, even though the total length of time spent is the same.

Jenkins and Dallenbach had some subjects learn tasks just before going to bed; others learned the same tasks upon arising.<sup>20</sup> All subjects mastered their material to the same degree. Tests



showed that a given lapse of time spent in the ordinary activities of the waking day brought more forgetting than did the same length of time spent in sleep.

Another psychologist, van Ormer, repeated the Jenkins and Dallenbach experiment using himself and his wife as subjects.<sup>21</sup>

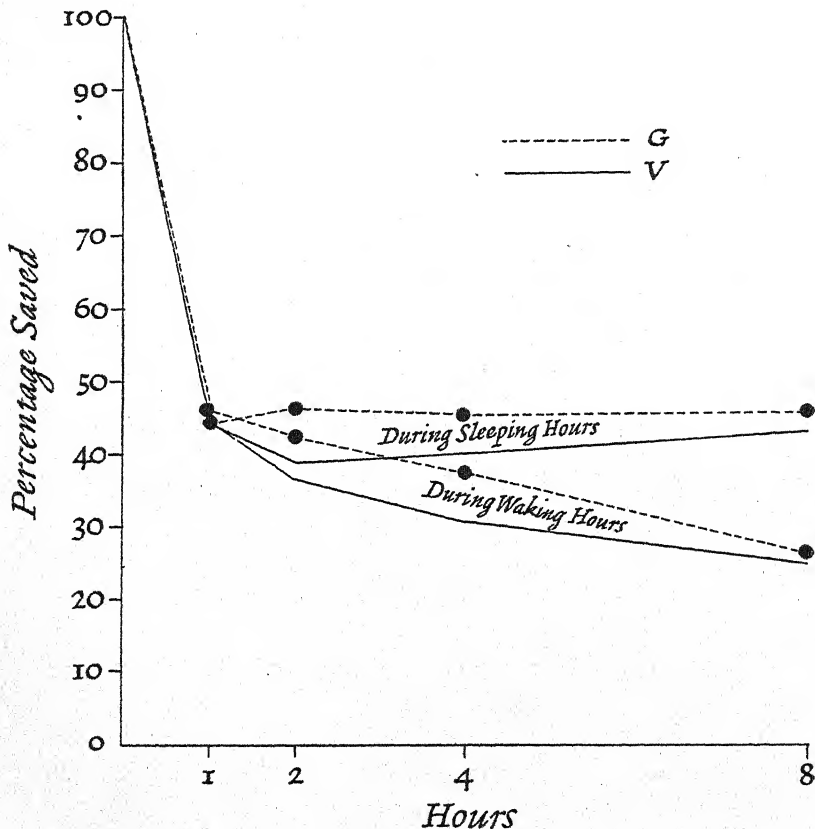


FIGURE 52. Percentage of material remembered after various time-intervals of sleeping and waking for two subjects, "G" and "V." (After van Ormer.)

Retention was measured by the method of relearning (p. 320) with confirmatory results. (See Figure 52).

Both these experiments point to forgetting as brought about by the destructive effect of other activity. Everybody will agree that the human being is much less active in sleep than when awake.

It would not do, of course, to say that the sleeping person is completely inactive, for we know that people dream and move about in their sleep. These are certainly activities. The point is that the activity level is lower during sleep than when awake and that forgetting is also observed to be less.

B. The factor of similarity. The obvious next step is to compare the effects of different kinds of waking activities.

McGeoch and McKinney divided subjects into three groups, all of which learned a poem and recalled it immediately.<sup>22</sup> Then followed a fifteen-minute interval spent differently by the three groups: Group I rested or engaged in non-learning activity; Group II learned a second poem; Group III learned nonsense syllables. All subjects were tested for recall of the original poem immediately after this fifteen-minute interval and again after a week had passed. Thus the only systematic variation in the conditions was the way in which the fifteen-minute interval following original learning was spent. By the logic of experimental method, any differences among the groups in the amount of subsequent recall of the first poem must be attributed to this single difference in conditions of learning for the three groups.

A study of Table 18 shows clearly that the effect of learning nonsense syllables or another poem was to interfere with the recall of the originally learned poem. Group I, the control group, recalled 92.1 per cent of the amount recalled immediately after original learning; Group II recalled decidedly less. Notice also that Group I had retained its superiority at the end of the seventh day following the original learning.

TABLE 18: *Average Performances of Three Groups in Recalling Verbal Materials under Differing Conditions*

GROUP	% (OF FIRST RECALL) RECALLED AFTER 15 MINUTES	% (OF FIRST RECALL) RECALLED AFTER 7 DAYS	NUMBER OF CASES
I (engaged in non-learning activity)	92.1	78.1	30
II (learned other poem)	86.4	59.2	37
III (learned nonsense syllables)	80.5	62.7	28

Notice that there is also a difference in the performance of Groups II and III, both of which spent the fifteen-minute interval in learning. Immediately following this interval, Group II, which learned a second poem, recalled the original one better than Group III, which learned nonsense syllables. At the end of seven days, however, these two groups have changed places.

Learning activity produces more interference than non-learning activity, and the greater the similarity between it and the original type of learning activity the more the forgetting of the first material learned. Subsequent experiments have shown repeatedly that it is the similarity between the two that is the important factor irrespective of the nature of the material used. Original learning may be of poems, numbers, nonsense syllables, designs, or what you will. If what follows is very similar, the interference will be very great; if learning of a different type of material follows, interference will be less; if it is non-learning activity, the interference will be still less; where sleep follows the original learning, there is little activity of any kind, and forgetting is comparatively very slight.

Is forgetting *entirely* a matter of learning something else during the period between the original learning and the relearning? The only way to answer this question would involve putting a subject into a state of suspended animation of some sort immediately after the original learning period. The subject would be kept in that condition for a long period of time and then brought back to normal and tested. If there was no loss whatever during the period, we would conclude that forgetting is entirely a matter of reorganization of habits and that it is independent of time. There is little likelihood that such an experiment will be conducted. Attempts have been made to approximate these conditions by putting subjects under anesthetics during the resting period. The results, however, are difficult to interpret because we have no way of knowing how many new factors are introduced by the anesthetic.

c. The factor of organization in material learned. Recently experiments have pointed to still another factor which plays an important rôle in the amount of retroactive inhibition that may be expected to occur.

Newman studied the forgetting of meaningful material after equal sleeping and waking periods.<sup>23</sup> Short stories were constructed to contain twelve items not essential to the plot and twelve essential items. The subjects read each story, at a different time of day, and were asked to recall it approximately eight hours later. The material recalled by each subject was scored by three judges independently. Results are given in Table 19. It will readily be seen that retention was markedly different for the two types of material. Note especially that the non-essential material was found to behave in the same way as the nonsense material of the other investigators.

TABLE 19. *Comparative Retention of Essential and Non-Essential Material after Waking and after Sleeping*

MATERIAL	% RECALLED AFTER WAKING	% RECALLED AFTER SLEEPING
<i>Essential</i>	86	87
<i>Non-Essential</i>	23	47

It appears that material with little or no organization, such as lists of unrelated items (nonsense syllables, dates, names, etc.), is less well remembered than that in which there is organization, such as material which is meaningful to us. Organized material seems to resist interference from things learned later in a way that mere unrelated items in a series are unable to do.

All these findings concerning retroactive inhibition have definite applications for the everyday life of all of us, particularly for students. Since forgetting appears to result from the destructive effect of other activity, especially similar learning activity, don't study French right after studying Latin; also, when learning something particularly important, rest afterward or engage in some activity entirely different from the first. Better yet, learn it just before going to bed. We have seen that meaningful material, having more organization than nonsense matter, has greater success in resisting interference by later learning activity; thus, when learning lists, unrelated facts, or verbatim material of any kind, it is important to make it as meaningful as possible and then to exercise all precautions possible in the timing and spacing of learning so as to avoid as much interference as you can.

*Pleasantness and unpleasantness in relation to remembering.* The psychoanalysts have made much of the factor of repression of extremely unpleasant experiences. (See p. 181.) The clinical evidence which they have found seems adequate to justify their views. However, what happens to the little experiences of daily life which are slightly pleasant or unpleasant? Is there any tendency for unpleasant experiences to be forgotten more quickly than pleasant ones? Many psychologists have investigated this problem with rather conflicting results. Meltzer in 1929 reviewed the results of twenty-six experimental investigations on the problem of pleasantness and unpleasantness in relation to forgetting.<sup>24</sup> Sixteen of these studies showed that pleasant, unpleasant, or both kinds of experiences are remembered better than those which have no feeling of pleasantness or unpleasantness attached to them.

Gilbert has reviewed most of those made since.<sup>25</sup> His review strongly supports the principle that pleasant memories tend to persist while unpleasant ones are lost. Of twenty experiments published since 1929, thirteen support this hypothesis, four deny it, and three give ambiguous results.

Pleasantness and unpleasantness, like activity, seem to have some effect on forgetting, though the exact relationship is not understood as yet. The evidence, however, adds weight to the hypothesis of forgetting as a dynamic process rather than mere passive decay.

*The effect of incomplete learning on memory.* The term *reminiscence* was first used by Ballard to describe a case in which later tests showed more memory than earlier ones had done, though no more practice had intervened. The subject-matter used was meaningful material, and learning in the first place had been incomplete. Apparently, meaningful material has a tendency to achieve a stable organization. This gives further confirmation of the notion that forgetting is not passive decay but an active process involving dynamic forces which continue to change and interact with each other and with new forces later introduced, long after the original learning situation has passed.

Martin found amount of reminiscence to be greater in children as compared with adults; for meaningful as compared with non-sense material; for individuals who try hard to recall as compared with those who give up more easily.<sup>26</sup>

*The effect of failure to complete a task.* Zeigarnik had subjects perform simple tasks, such as writing down a favorite quotation from memory, solving a riddle, or doing mental arithmetic problems.<sup>27</sup>

The tasks were simple ones which the subjects could accomplish if given sufficient time. With some of the tasks subjects were interrupted before they had a chance to carry out the instructions in full. Other tasks they were permitted to finish. Despite the fact that the completed tasks actually took more time than did the interrupted tasks, more of the interrupted tasks were remembered later than the uninterrupted ones.

Marrow conducted a similar experiment with a series of twenty simple tasks given informally to college students.<sup>28, 29</sup> The subjects recalled the uncompleted tasks about fifty-seven per cent better than the completed ones.

A more extreme example of this same effect is the college student who studies a difficult problem in algebra just before going to bed. He can't get the answer and so decides to try in the morning, refreshed by a night's sleep. However, the problem keeps coming into consciousness, sometimes making sleep impossible.

This effect is an instance of what is called "activity in progress." Once we get started toward a goal, we tend to persist. After the goal is reached, our motivating tension is reduced, and the whole effort may be forgotten.

There are many examples to be drawn from daily life. You look up a seldom used telephone number, dial it, find the line busy. After five minutes you try again without having to look up the number. This time the line is free. You complete your conversation in thirty seconds, hang up the receiver, and the phone number is forgotten. It has served its purpose. Items relative to activity in progress are remembered.

*Is anything ever completely forgotten?*

Are the effects of learning ever completely erased? Ebbinghaus has given us an interesting demonstration of the fact that the effects of learning may be retained after many years.<sup>30</sup> This psychologist relearned stanzas of the poem *Don Juan* after a lapse of twenty-two years. At the time the relearning was started, no evi-

dence of memory was apparent upon introspection, and there was no objective recall of the lines of the poem, but the time required to relearn the stanzas previously learned was less than that required to learn stanzas not previously studied. The fact that old people frequently recall quite vividly the scenes of their childhood after many years of not thinking about them suggests that the effects of experience are not completely lost but persist in some form throughout our lives.

### *The coming back of youthful memories*

The coming back of youthful memories was studied by the late Professor Warren, who reported two cases of the spontaneous recurrence of memories of which the subjects had been completely unconscious for long intervals of time.<sup>31</sup> Professor Warren's father at the age of ninety years suddenly recalled a poem which he had learned seventy-five years previously. He was unable to recall ever having rehearsed the poem during the long interval. A similar case was that of an elderly gentleman who at the age of eighty-three years recalled an oration learned as a young man and not recited during the interim.

Youthful memories come back in reverse order. As the person becomes older and older, earlier and earlier memories come back. The writer once observed a typical case of a German-speaking person who had come to the United States as a young man and who had not used his original language for nearly sixty years. He began to complain that he found himself forgetting English words for familiar objects and that the German words kept intruding in their place.

There is at the present time no generally accepted explanation of the phenomenon of spontaneous recurrence of youthful memories.

### *Learning Ability Varies with Age*

**A**S PEOPLE grow older, there are numerous changes in their ability to learn, which are as fascinating to study as they are important from the social point of view. Do human beings reach an age beyond which no further learning is possible? At what age



should one attempt to learn a particular skill or subject-matter with expectation of maximum returns on one's investment of time and effort? A good share of the literature on this important problem has been brought together in summaries from which certain significant conclusions can be drawn.<sup>32, 33</sup>

### *Learning ability in youth*

Numerous researches with various types of learning tasks show that "sheer modifiability," to use a term of Thorndike's, increases with age to find its peak near the age of twenty years.<sup>32</sup>

Brown has found that age seven is the best year for learning the first ten piano lessons.<sup>34</sup> Numerous studies show that the learning of reading too should start at about this age, rather than earlier as has been the traditional practice.<sup>35</sup> The ability to learn poetry is at its height during the middle teens.

### *Learning ability in middle age*

Ability to learn certain tasks of a highly complex nature resting upon basic skills or knowledge grows until a point well beyond the age of twenty years. Ability to exercise sound business judgment continues to grow into middle age and is, in fact, one of the last abilities to be lost in old age.

Excellence of performance of motor skills in relation to age has been studied by Lehman, who analyzed the data given in the "All Sports Record Book."<sup>36</sup> Table 20 shows each sport listed in the order of the increasing ages of maximum proficiency.<sup>37</sup>

Learning ability in general declines gently from age twenty to age fifty. For all practical purposes, however, this loss is so slight as to be unimportant. Although sheer modifiability does fall off slightly during this period of thirty years, the person has, during his youth, acquired so much education and training in the skills and techniques of his vocation that the slight loss of ability to learn new material is of no practical consequence. Moreover, the adult has learned all the basic necessities. During this period of maturity he is required merely to add new details to his mental stock.

TABLE 20: *Mean Age of Maximum Proficiency in Sports and Games*

TYPE OF ACTIVITY	MEAN AGE	NO. OF CASES
Professional football	25.72	485
Professional boxing	26.98	448
Professional ice hockey	27.56	823
Tennis (based on French, English, and American champions)	27.63	317
Major league base-stealing (based on champions)	27.96	63
Duck pin bowling (women)	28.13	90
Major league pitching	28.18	88
Automobile racing	28.81	54
Professional baseball (not including pitching)	29.07	3126
Major league batting	29.16	96
Professional baseball (pitching)	29.50	1666
Golf (based on English and American amateur champions)	29.88	74
Corn-husking	30.39	87
Golf (based on English and American open champions)	31.01	88
Rifle and pistol shooting	32.05	630
Duck pin bowling (men)	32.19	91
Golf (based on English and American professional champions)	32.33	48
Bowling (based on champion individual performances)	32.78	58
Bowling (based on champion team performances)	33.38	238
Billiards (based on world championship winners)	34.35	136
Billiards (based on world record breakers)	35.67	42

### *Learning ability in later maturity*

Soon after the fiftieth year of life learning ability starts to fall off at an increasingly rapid rate. By the time the average individual has reached the age of seventy, his ability to learn material unrelated to his past experience is very low indeed. Of course there are great individual differences. Although everyone loses some of his early ability, thus making the average ability of an older group less than that of a younger one, nevertheless those individuals who were very superior in their youth will still in

their old age remain superior to many younger individuals of less initial ability.

The decline with age in learning ability depends upon the nature of the task to be learned. The writer performed a series of experiments in which groups of young and of old people learned two motor and three verbal tasks.<sup>38</sup> One of the motor tasks was learning to perform a coördinated movement of the right hand when seen in direct vision. The other motor task was learning to perform the same type of movement when the vision was not direct, the hand being seen through a mirror. Notice that in the first of these tasks the habits of a lifetime were useful. Many of the basic elements of the complex habit had been practiced in random fashion through daily manipulation of objects. The second motor task, however, was of such a sort that the old visual habits would actually interfere. Before the mirror-vision habit could be set up, the old direct-vision habits had to be torn down. The results showed quite clearly that the aged learners suffered the greater loss of ability in the case of the mirror-vision learning task.

The three verbal tasks showed results which were subject to the same interpretation. These three tasks were the following: (1) associating meaningful pairs of words, such as HORSE-SHEEP; (2) associating nonsense materials, of which  $F \times P = V$  is a sample; and (3) associating interference materials, such as  $2 \times 4 = 9$ . The subjects learned to give the second member of the pair upon seeing the first. Notice that the meaningful words can be grouped by some logical principle, i.e., both are animals which eat grass, while the nonsense materials are purely arbitrary.  $F \times P$  could equal  $V$  or it could equal any other amount. The interference materials are so labeled because old verbal habits *interfere* with their acquisition. We are so used to thinking and saying 8 when we see  $2 \times 4$  that it is very hard to learn to say 9. The young group was superior to the aged in all three tasks. The differences between the young and the aged subjects were least for the meaningful pairs of words and greatest for the interference materials, with the nonsense equations standing in an intermediate position of difficulty. Obviously the amount of decline in learning ability depends upon the task.

These findings may be used to explain the increased conservatism of older people. Times change as the years pass, calling for the acquisition of new facts and skills in every walk of life. Old people lose progressively in their ability to master new materials and habits and by consequence find themselves reacting to present problems upon the basis of past acquisition which is no longer applicable. Such persons are conservative or even reactionary depending upon the degree of loss of learning ability.<sup>39</sup>

Popular belief has it that the memory of the aged person is decidedly inferior. This conclusion is based upon the unanalyzed results of everyday experience and is not altogether trustworthy. There is no doubt of the fact that old people lose their ability to recall names of recent acquaintances, but the fault here may well be merely one of original impression. Perhaps they did not *learn* the name properly in the first place. In that case the ability to memorize is at fault, and not the ability to retain that which has been memorized. There is no decisive answer to this question in the psychological literature, though there is some evidence that memory of material well learned does not decline nearly so rapidly as ability to learn in the first place. Here is a problem which remains to be investigated more thoroughly.

### *The moral*

Youth is the time for learning. Maturity is the period in which the human being should give back to the world the products of his educated effort. For the average man or woman in the seventies to take up some entirely new type of activity and achieve a high degree of proficiency is almost unheard of. We frequently read of some aged person achieving success in an outstanding way in a new field, but close study of the case will usually reveal that the individual had for many years been an amateur in the field. For example, William De Morgan wrote his first novel after he had reached the age of seventy years, but he had always associated with literary people and during his entire business career as a manufacturer of pottery had read widely in anticipation of the time when he would be free to try his hand at writing.

There is no reason why old people should give up trying to learn skills and gain knowledge that are extensions of past learn-

*ing.* Many people look forward to retirement from active business or professional life as an opportunity to pursue interests that have been neglected due to the pressure of work. This is a thoroughly fine practice, provided the older person chooses interests that are not too new to him or, if he chooses quite new fields of endeavor, that he be more lenient in setting standards for himself than he was in his youth. The writer is acquainted with a man who had never played golf before the age of sixty but who can now at the age of sixty-nine cover a course with a par of 72 strokes in never more than 80. This man, however, had, when a boy, worked as a railroad construction hand using a small maul to drive spikes and had been an excellent baseball player as a young man. In his golf he incorporated the elementary basic skills acquired in his youth. A woman who has always taken an interest in furnishing her home could reasonably expect to profit greatly from the study of interior decoration during the period of later maturity. However, a person who had devoted the first two-thirds of his life to painting or literature would probably have too much difficulty in learning mathematics or physics to select either as a hobby.

Learning bridges the gap between our innate behavior patterns and the requirements of our environment. It is paramount in all aspects of daily living. Learning occurs when some condition of the environment causes the individual to repeat a certain response leading to satisfaction of some need. Increasing the strength of the need will usually cause learning to progress more rapidly.

Learning is measured in terms of greater accuracy and speed of performance, as lowered energy cost per unit of work accomplished, and by decreased feelings of effort in performing the task learned. The progress of learning in the typical case is probably slow at first, then faster and faster, followed by a phase in which it takes place more and more slowly until the physiological limit is reached. The physiological limit is a level of perfection beyond which further practice brings no improvement. Plateaus or points of slow progress frequently occur in the learning of complex tasks. Such plateaus may be due to loss of interest, or they may cause a loss of interest. Frequently they are due to changing one's mode of attack or to interference from other habits.

Forgetting is a progressive loss of the effects of learning. Forgetting is not purely passive decay, because the rate of forgetting depends upon the activities of the organism during the forgetting period. There is some evidence to show that pleasant experiences are remembered longer than unpleasant ones and that both kinds are remembered better than those which are neither pleasant nor unpleasant.

Youth is the time for learning. In old age learning is harder but not impossible. Older people should be able to use the product of a youth spent in learning.

### *Recommended Readings*

BODE, B. H. *How We Learn*. Heath, 1940.

This book approaches the problem of learning by a consideration of the various theories that have proved of outstanding importance for education. Of interest to the historically-minded.

FREEMAN, F. N. *How Adults Learn*. In: *The Rôle of the Library in Adult Education*. University of Chicago Press, 1937.

This is a review of the scientific evidence on the intellectual ability and capacity for adults.

GUTHRIE, E. R. *The Psychology of Learning*. Harper, 1935.

A behavioristic account of the learning process.

HILGARD, E. R., and MARQUIS, D. G. *Conditioning and Learning*. Appleton-Century, 1940.

A book for the serious student. The facts and theories of learning which makes use of conditioning principles are critically examined in this able work.

HULL, C. L., et al. *Mathematico-deductive Theory of Rote Learning*. Yale University Press, 1940.

The authors offer a detailed deductive theoretical system for rote learning. The discussion includes a great variety of learning problems. For the serious student.

HUMPHREY, G. *The Nature of Learning*. Harcourt, Brace, 1933.

The author attempts to relate the phenomena of learning to the more fundamental concepts of physics and chemistry.

MILES, W. R. "Psychological Aspects of Ageing." In *Problems of Ageing*. Ed. by E. V. Cowdry. Wood, 1939.

Age is discussed in relation to the speed and accuracy of learning and memory as well as to many other psychological aspects.

SORENSEN, H. *Adult Abilities*. University of Minnesota Press, 1938.

A study of University extension students stressing the importance of adult education. Recommended especially to prospective educators.

THORNDIKE, E. L. *The Psychology of Wants, Interests, and Attitudes*. Appleton-Century, 1935.

Reports work done to discover how wants, interests, and attitudes influence learning and how they themselves are learned.



"If you want learning, you must work for it." J. G. HOLLAND

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## CHAPTER 10

# THE MANAGEMENT OF LEARNING

*How to learn, what to learn, when to learn it, and who can learn it. These are the Big Four among the principles of good management of learning. Incidentally, "strengthening the mind" is not a special virtue of Latin or mathematics. . . . It's not what you learn but how you learn.*

LIKE A MILITARY CAMPAIGN, an effective learning program is to a large extent a matter of tactics. Given the same men and material, one general might gain a given objective with minimum losses where another general would fail, simply because the first was a good tactician and the second was not. Your position in planning your life program of learning is very much like that of a general planning a military campaign. Oftentimes the difference between a good student and a poor student is not so much a matter of inborn difference in ability to learn as it is a difference in management of those abilities. You have a certain inborn ability to learn. That ability is fixed by heredity, and there is nothing you can do about it except to plan its effective use. Two individuals of equal inborn ability, of equal educational opportunity, and of equal

health will make equal progress toward their objectives only when the two are equally good tacticians.

You can learn to learn. Numerous experiments have been performed in recent years to find out how to aid failing students through specific learning based on methods and principles which are scientifically sound. The results of a successful experiment of this sort are given in Table 21.<sup>1</sup>

TABLE 21: *Records of How-to-Study Group As Compared with Group Receiving No Special Help*

GROUP	% DOING PASSING WORK DURING QUARTER PRECEDING EXPERIMENT	% DOING PASSING WORK DURING EXPERIMENT
Given special help	25	70
Given no special help	27	34

We can see that the students who were placed in the how-to-study laboratory showed a gain of 45 per cent as against a gain of but 7 per cent for the others. That the study laboratory is really worth while as a means of helping the failures is clearly shown by these figures. How long do the results of special instruction last?

TABLE 22: *Records of How-to-Study Group As Compared with Group Receiving No Special Help after Quarter in Which No Further Special Help Was Given to Either*

GROUP	NO. IN GOOD STANDING	NO. DISMISSED FOR LOW SCHOLAR- SHIP		NO. BACK ON PROBATION	NO. OUT FOR OTHER REASONS	AVERAGE NO. OF HOURS CARRIED
Previously given special help	18	3		4	6	14
Previously given no special help	8	11		6	6	13.4

Study of Table 22 shows that the effects of the training received in the study laboratory were not lost by the end of the quarter following the one in which the training was given.

Sometimes, unfortunately, the effects of "How to Study Courses" are only temporary or are limited to the students of higher ability at the outset.<sup>2</sup> When this occurs, it usually means that the indi-

viduals concerned have not cared to be good students. There is nothing in such findings to discourage the individual who really wants to improve his learning ability.

In the following section you will become acquainted with some of the ways in which the psychologist can help the student increase his efficiency in learning and hence raise his scholastic standing. First let us see how good a student you already are.

### *How Good a Student Are You?*

**N**UMBER LINES in your note-book from one to thirty. Read the questions that follow and answer each one "yes" or "no" as honestly as you can. If taken seriously, this self-inventory can help you eliminate some of your serious faults. Answers to the questions will differentiate the efficient from the inefficient among learners and furnish a foundation for self-improvement.

#### STUDY-HABIT INVENTORY .

1. Do you sometimes study with the radio going or with other persons talking in the same room?
2. Do you read and study by indirect (diffused) light?
3. Do you read under a colored light?
4. Do you try to study with others whenever possible rather than alone?
5. Do you usually have to smoke while you study?
6. Have you had your eyes tested by a good oculist or optometrist within the past two years?
7. Do you read so slowly that you have trouble covering all your assignments?
8. Do you move your lips or mumble while studying hard passages?
9. Do you have a tendency to day-dream when you should be studying?
10. Do you have to wait for a mood to strike you before attempting to study?
11. Does every little noise disturb your train of thought while studying?
12. Do you sometimes discover that you have turned several pages in your textbook but that your "mind is blank" for what was said on them?
13. Do activities often interfere with your study periods?
14. Do you often wish that you could drop out of school and get a job?
15. Do you sometimes make simple charts or diagrams to represent points in your reading?

16. When you find a new word in your reading, do you usually look it up in the dictionary?
17. Do you usually skim over a reading assignment before studying it in detail?
18. Do you keep your class notes and reading notes for each subject together?
19. Do you often take notes in class just as fast as you can write?
20. Do you generally take your notes on reading assignments in outline form?
21. In studying for a quiz or examination do you try to memorize the exact words of the textbook?
22. Do you try to use the facts learned in one subject to help you understand another subject?
23. Do you sometimes sit down to study at home and discover that you do not have the exact assignment clearly in mind?
24. Do you frequently try to analyze your work to find out where you are weak?
25. Do you hesitate to ask your instructor to explain points that are not clear to you?
26. Do you have trouble picking out the important points in a study assignment?
27. Do you mark important or difficult passages in your textbooks as you study so that these points can receive special attention when you review?
28. Do you study a subject with the idea of remembering it only until the course is over?
29. When studying do you stop every now and then to force yourself to recall what you have just read?
30. Do you study late into the night or even all night before an important examination?

At the end of this chapter (page 370) you will find the answers which characterize the good student as compared with the poor one. Turn to that page and score your responses. Each disagreement with the key indicates a bad habit or attitude to be corrected. Draw up a summary of your weak points and post it on the wall above your study desk. Review this list frequently and set yourself to overcome your difficulties. Seize every possible opportunity to practice the correct habits which you lack. As time goes on, this will become easier to do. But remember that it will be hard work at first.

## Reading Your Assignments

READING ABILITY is something which can be acquired through hard work and the elimination of inefficient habits.<sup>3</sup> People vary greatly in their native ability for reading, but they probably differ even more in the extent to which they have developed their latent talents for rapid and effective reading.

### *Setting the stage for effective reading*

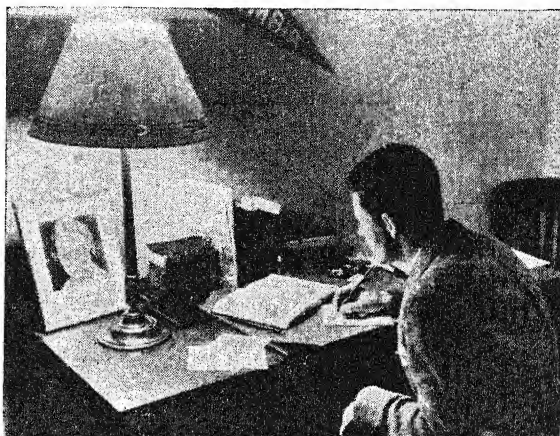
If you were a seasoned manuscript editor, capable of reading 25,000 words per hour (the equivalent of some 60 pages of an ordinary book), this section would be of little value to you. The typical student, however, will be able to learn a great deal of permanent value by carefully studying and observing the following rules of reading.

① Have your eyesight tested. Good eyesight is the first essential to effective reading. If you suffer from a headache, smarting or burning eyes, or a feeling of tension around the eyes following a period of reading, you should consult an eye specialist for thorough test of your vision.

② Control the illumination. Read in diffused or indirect light rather than in the harsh glare of an unshaded globe. Ferree and Rand measured the effects of three hours of continuous reading under three types of illumination.<sup>4</sup> The cost of the reading effort was measured in terms of discomfort and the time of the onset of fatigue. Discomfort was determined on the basis of the subjects' introspections; fatigue, as inability to sustain clear vision for a period of three minutes. Sustained clear vision is much more valid than momentary visual acuity as a test of resistance to fatigue, since the organism even when tired can "snap out of it" for a second or two. Clear vision cannot be maintained for more than a few seconds when the eyes are tired. Ferree and Rand found that indirect lighting is superior to either direct or semi-direct lighting.

Tinker has shown that the intensity of the illumination in the visual field is not so important as its uniformity.<sup>5</sup> The human eye is remarkably able to adjust to widely differing levels of intensity. The pupil of the eye adjusts to the average light, so that a dark field with a few bright lights is more strain than a bright field that

FIGURE 53. *Uniformity of light on the working surface—note how the top of this desk is lighted evenly—is the most important factor for the eyes within wide limits of intensity. Fortunately your eyes are your best meter. If you are comfortable, if your vision is constantly clear as you work, by definition your lighting is good.*



is uniform. The typical adult is safe in trusting to his own introspections to determine what is an adequate amount of illumination for him if there are no glare spots in the field of vision.

Avoid green and blue light. Natural daylight of uniform intensity is the easiest on the eyes. After this come yellow, orange, and red light. The blue and green lights of the upper end of the spectrum are decidedly hard on the eyes.<sup>6</sup> The color of light is not indicated by the color of the bulb. You must trust your dealer to tell you about the spectrum of the globe he sells you.

**3** Correct your eye movements. Just as it is possible to learn poor habits in golf or tennis, so is it possible to acquire faulty eye movements. Reading is more than a motor skill, but poor eye movements are certainly a sign of a poor reader and are probably a contributing factor to poor reading. It is impossible for a reader to observe his own eye movements, but it is a very simple matter to observe those of another. Watch somebody read and you will notice, as we saw in Chapter 7, that in traversing the length of the printed line the eyes make several jumps rather than gliding smoothly. The jumps are made very rapidly, each requiring but a thirtieth to a fiftieth of a second. Normal readers make only a few stops per line and spend about ninety per cent of the time in fixation as against ten per cent in jumping. This is as it should be, since nothing is seen during the eye's jumps. Poor readers, however, make many unnecessary eye movements. Besides requiring more fixations per line, they do not sweep clean as they go but

have to go back frequently. This, of course, means wasted time and effort. The difference between the eye movements of a good and a poor adult reader is in general about the same as that between an average adult and an average child.

The average adult makes four or five stops on an ordinary line of printed matter, whereas children make from five to twelve. The average adult makes no more than one regression or "back track" per line, while the child makes from four to seven. The adult makes the return sweep from the end of one line to the beginning of the other with a high degree of accuracy, the child quite inaccurately. Fine observations made with elaborate photographic equipment show that adults do not pause so long at a fixation as do children.

The span of visual apprehension, or the number of words which can be taken in at a glance, is usually much greater than the number of words actually taken in. This fact suggested to Gray that it might be possible to decrease the number of fixations required for a line without lessening the individual's comprehension of the material read.<sup>7</sup> He tried it out experimentally and found that the inference was correct. In one experiment a poor reader decreased the number of pauses per line from 15.5 to 6.1 as a result of twenty minutes of practice daily for a period of only twenty days.

The span of visual apprehension in adults cannot be increased appreciably through practice, although that of young children can. Consequently, the success of Gray and others in reducing the number of fixations required by an adult to read a line of print understandingly must be attributed to the elimination of excessive overlapping of the apprehension spans of successive fixations rather than to the increasing of the length of the span itself. Regardless of the explanation, the important and applicable fact is that the reader can increase the efficiency of his reading by forcing himself to take in more words at one fixation and, therefore, to make fewer fixations per line. The eye movements of a good reader are to those of a poor one as an express train is to a local. Both trains get you there, but the express train gets you there sooner. The student must remember that making fewer pauses does not mean skipping words and phrases. Logically, words group themselves into higher units. The good reader is the one who is able to grasp a whole



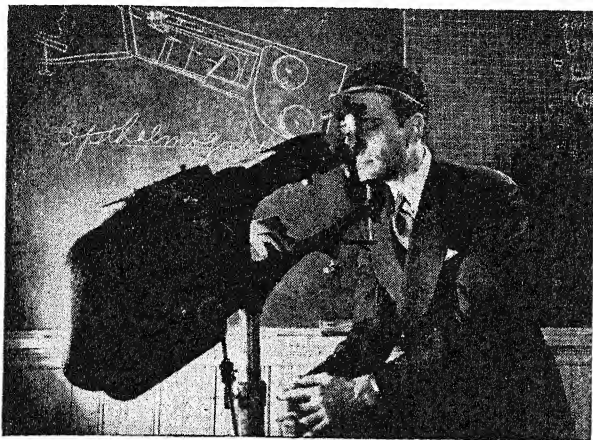


FIGURE 54. *Happily the way we read is no longer a matter of guessing but of science. The machine shown here, an ophthalmograph in professional circles, records with wonderful clearness the movement of the eyes in reading. Then diagnosis of difficulties, appropriate recommendations are easy.*

phrase or even more at a time. Cultivate this ability by diligent practice. Numerous studies show that fast readers get more meaning from material read than do the slow ones. Thus the fast reader enjoys a double advantage.

④ Do not vocalize as you read. You have no doubt noticed muttering and whispering by children, old people, or foreigners trying to read. Such activity is also characteristic of many poor readers. Such vocalization lowers the rate of reading and acts as a distraction to prevent the reader from grasping the full significance of the material read. If you observe this trait in yourself, practice to overcome it. It is true that even a good reader makes some small movements of the vocal apparatus, but they are so reduced that they are not perceptible to the naked eye.

Many studies on improving the reading ability of college students have been made. They can be of great assistance to you.<sup>8, 9</sup>

### *Making material meaningful*

Meaningful material is easier to learn than the same number of nonsense units. This fact has been demonstrated time and time again in the psychological laboratory. The student can demonstrate it for himself by trying this experiment. Follow the directions closely.

Read the following series of twenty nonsense syllables twice; then close your book and try to write down as many of them as you

can recall. Compute your recall score as a percentage and record it for later comparison.

GOG, ZIB, CUX, RIX, ZIN, DOV, MEB, PEZ, ZOR, REB,  
KEP, ZIR, GAM, NEB, GEP, GOK, ZOD, WUB, KIZ, VEB.

Now read over twice the following list of related nouns and then proceed to write them down in proper order without further study. Compute your recall score and record it alongside the first.

Tree, grass, cow, horse, race, human, monkey, circus, carnival, tent, house, brick, clay, fire, police, judge, lawyer, doctor, teacher, student.

Now read the following sentence and repeat the test as before.

Little Wilbur, whose father is a college professor, thinks that he wants to be an aviator when he grows up.

Compare your recall scores for the three types of material. Which was best? Which was poorest? Have you now any doubt as to the relative learnability of meaningful, as compared with nonsense, materials?

Many studies in psychological laboratories have been devoted to this problem. English and his co-workers had groups of students read specially prepared articles averaging 1100 words in length.<sup>10</sup> The material was read carefully twice, a condition which approximates the manner in which the average student prepares his daily assignments. Some of the subjects were tested immediately after reading the material, some after twenty-four hours had passed by, and the rest at the end of a two-day period. The subjects were tested for rote memory of specific facts and for comprehension of the essential thought contained in the passages studied. In the

TABLE 23: *Retention of Rote Facts Compared with Memory of Essential Thought after Different Time Intervals*

TIME OF TEST	MEDIAN SCORE ON ROTE- FACT TEST	NUMBER OF SUBJECTS	MEDIAN SCORE ON COMPRE- HENSION TESTS	NUMBER OF SUBJECTS
Test given immediately	9.04	73	9.33	75
Test after 24 hours	7.62	66	9.33	67
Test after 48 hours	6.36	73	9.25	70

test of rote memory, the students had to label as true or false statements given in the exact words of the text. Comprehension was tested by having the students label the truth or falsity of statements which expressed the idea of the passage but in other words. The results for the two types of tests are shown in Table 23.

Study of this table reveals that the students lost practically nothing in comprehension over the forty-eight-hour period, whereas they declined significantly in their mastery of specific facts. The obvious implication for the student is expressed in the rule: "Make your material meaningful." It will be easier to learn and easier to remember. If you learn the text of your book as so many meaningless statements, you may eventually be able to recite a good share of it in parrot fashion, but it will never become a real part of your mental equipment and will soon be lost.

There are many ways to make material meaningful. Some of these rules are briefly described below:

① Skim the assignment first. Read over the assigned materials as rapidly as you can before starting intensive study. This will give you a bird's-eye view of the whole and add greatly to the meaning of the parts.

② Relate new facts to old problems. In your note-book list problems of pressing interest to you. When you encounter a new fact, ask yourself how this fact affects your attitude or action on some problem or belief. Strive to relate facts to personal problems. How does this fact help you choose your life work? How does that fact better enable you to control your temper?

③ Cross the boundaries between courses. One of the weaknesses of American education is the practice of breaking up the whole field of knowledge into more or less water-tight compartments. This effort is absurd and impossible of success, because truth is unitary. The borderlines between psychology and physiology are vague and undefined; those between psychology and sociology are equally tenuous. Any attempt to distinguish sharply between closely related fields of knowledge is bound to be arbitrary and confusing. As a student of psychology you are concerned with a subject which has important relationships with every other branch of learning. Keep asking yourself how the facts before you relate to the materials of another course. How does the material on con-

ditioned emotional responses to words affect your understanding of the power of poetry to evoke sentiments?

① *Do not skip tables and graphs.* In a well-written textbook the tables and graphs and most of the pictures are organic parts of the textual material. Since tables, graphs, and pictures cost much more to print than does the same amount of space in solid type, the author and publisher are careful not to include any tabular or graphic material which does not add to the interest or clarity of a discussion. This type of material should be studied as you read the text.

② *Draw up a summary in outline form in your own words.* Any book contains much illustrative matter that is not absolutely essential. Such materials are introduced to keep the style from becoming too heavy and to drive home by means of interesting examples some fundamental point. Prepare a summary of the essential material, neglecting the anecdotes and illustrations, which tend to stick of themselves. In writing your summary, emphasize the principles illustrated. But above all else, make the summary in your own words. No amount of mechanical copying of meaningless sentences lifted bodily from a text will aid learning as much as the preparation of your own version. In writing a summary you will discover which parts you understand thoroughly and which topics require more study. Moreover, a summary, if carefully prepared, can be used for review, thus obviating the necessity of going through the incidental material again.

③ *Avoid the use of crutches.* Enterprising individuals have made fortunes from the commercial exploitation of "memory systems." Some of these so-called courses contain much that is psychologically sound, but most of them contain a great deal of drivel. The writer is reminded in this connection of a notice he once saw on a bulletin-board. It read in effect:

LOST: *One Master Mind Memory Course.*

Below this notice some wag had scrawled:

"What! Did you forget where you put it?"

One typical memory course teaches the subject a series of complex rules whereby a simple task can be made simpler. Stephen Leacock has given us a facetious example of the use of such a

memory system. The task is to remember that Adams followed Washington as President of the United States. This is the way you do it:

Washington evidently suggests washing.  
Washing evidently suggests laundry.  
Laundry evidently suggests the Chinese.  
The Chinese evidently suggest missionaries.  
Missionaries evidently suggest the Bible.  
The Bible begins with Adam.

How ridiculously simple!

Memory devices frequently employ accidental associations which have a way of tripping us up in the end. For example, a schoolboy tried in this way to remember when Columbus discovered America:

"In fourteen hundred ninety-two, Columbus sailed the ocean blue."

Unfortunately when he tried to recall his little jingle, it came back like this:

"In fourteen hundred ninety-three, Columbus sailed the deep blue sea."

Crutches are not always bad. There are good and poor crutches for the memory. There are certain arbitrary facts which can be held together by means of a memory device until usage has cemented them firmly. The rule that oysters are to be eaten only in the months that have an "r" in them is a good example of a worthwhile aid to memory, provided, of course, that the rule has truth for your section of the country. Memory devices of that sort are to be relied upon when there are no broad generalizations possible from the facts to be remembered. The advantage of the broad generalization over the specific memory trick is that the former functions in many situations, while the latter is of use only in the specific situation for which it was learned. For example, if you have learned that disease germs grow more rapidly in warm than in cold water, you would be able to predict, or at least remember the fact, once it is pointed out to you, that oysters are a health hazard in summer if refrigeration is incomplete. On the same basis you could remember not to leave milk, butter, or meat out of the ice-box. The knowledge that bacterial action goes forward faster in warm than in cold surroundings would be of use

in understanding other problems of fermentation and putrefaction in life and in the laboratory.

### *Making use of guidance*

The function of the instructor is to guide the learning efforts of the student. Good teaching prevents the student from making costly errors and from acquiring bad habits or misinformation which will be a detriment in later study. The instructor has had an opportunity to study and analyze the types of errors which are frequently made, and consequently he can warn the student to be wary of them. The instructor also sees relationships which might escape a student left without help. By asking the right question or by planting the proper suggestion, the instructor can guide the learner to the correct solution of a problem, greatly reducing the trial-and-error period in the attack on the problem.

Many of the essential facts concerning the use of guidance in teaching students to see relationships are demonstrated by Waters's comprehensive and well-controlled investigation.<sup>11</sup> Waters selected as a problem to be learned under experimental conditions the interesting parlor trick which is played as follows: Seven beads are placed before the subject who is asked to draw one or two of them, and then permit the experimenter to draw one or two. The object of the game is to ensure the taking of the last bead. The subject must take the last bead to win. In this game we have an interesting subject-matter which is capable of being taught in various ways.

The principle which, if applied, will always win is simple to state. Always draw to reduce the number of beads to multiples of three. Since there are seven beads to start with, you draw just one to leave six. If your opponent then draws one, you take two; if he draws two, you take one. Either of these procedures will leave three beads for your opponent's final draw. If he takes one, you take the last two and win; if he takes two, you take the last one and win. You can always win if you have first draw and follow the rule given. This problem can be varied by increasing the number of beads with which you start or by increasing the number of choices in the drawing. For example, you might permit the drawing of one, two, or three beads at a time. A fundamental principle can be discovered for these conditions as well.



Waters played this game with his subjects, who had been instructed at the beginning of the experiment to find the general rule as soon as they could. He employed various methods of instructing his subjects. Some of them were taught by having their errors pointed out to them; others saw the winning move demonstrated but without explanation of the principle. Some of the subjects were instructed specifically in advance that they were to draw to leave a multiple of three. Other subjects were given the more general principle of drawing to leave a number of beads equal to a multiple of the largest plus the least number of objects which could be drawn at one time by the rules of the game.

The results showed quite clearly that demonstration of the correct method without explanation of the principle involved is of little value in teaching the solution of the original problem or in helping to solve a more complicated one of a similar sort. Giving a short statement of the principle in advance, however, will help decidedly, but the statement must be general enough to fit all related cases if it is to be of value in guiding the student's efforts toward unaided solution of similar problems. Pointing out errors which are specific to the problem at hand will aid in the solution of that problem but will not carry over to other similar ones.

Guidance when given should come at the beginning of the learning process to be of the greatest help. If continued too long, guidance becomes harmful. These conclusions apply generally to the teaching of any subject-matter involving logical principles and the formulation of generalizations.

Guidance is valuable also in teaching individuals to perform motor acts in a skilful manner whether in athletics or in industry. Here too guidance can be detrimental rather than beneficial, depending upon how and when it is given. The rules for the use of guidance vary with different skills, but there are a few which apply pretty generally to ideational as well as to motor learning.

① *Discover and eliminate your errors early in the learning process.* The good athletic coach watches his players closely to detect waste movements. These are pointed out to the learner, who might never discover them for himself. In verbal learning the teacher does the same sort of thing. Specially constructed diagnostic tests are frequently used for this purpose.





FIGURE 55. *You're never too good for guidance, even in professional football. Like learners in any field, veteran Chicago Bears who may have performed magic with the ball the preceding day must listen to Coach Halas analyze their waste motions and point out adjustments they might never have discovered by themselves.*

① *Expect less and less guidance as your learning progresses.* Beware of guidance continued too long. Expect your coach or instructor to start you on the right foot, and then be content to shift for yourself.

② *Ask for guidance of the very reaction which is to be used later.* You cannot learn to play golf by swinging a club through a set of curved rods which represent the course of the ideal swing. You cannot learn to write by tracing letters in a copy book. You cannot learn to play the piano if you let some other person press your fingers on the keys. These are not the reactions which are to be used later. Guidance should consist in showing you the right path, not in carrying you along it. If you are at the wheel the only time you go over a particular road, you will remember that road much better than you would if someone else does the driving.

### *Relying upon methods and techniques, not formal discipline*

There was a period in American educational practice when authorities defended the doctrine of formal discipline, urging that the student study certain subjects because of the supposed strengthening effect of such activity. Latin, Greek, and mathematics were favorite subjects. These subjects, they argued, are logical; therefore, their study should make one's mind logical, and, of course, a logical mind can master almost anything. This belief in such a transfer of training went unchallenged for a long time. Eventually it was questioned. In the first attempts, the defenders of formal

discipline seemed to prove their case, but later investigations showed how wrong they were.

A study conducted by Harris is typical of many carried out to test whether the study of Latin did actually make easier the learning of another subject, as the proponents of the formal discipline theory so stoutly maintained.<sup>12</sup> Harris was interested in finding out whether the study of Latin strengthened the ability of the student to acquire a command of English writing. His results are shown in Table 24.

TABLE 24: *Correlation between Study of Latin and Grades in English Classes*

YEARS OF LATIN STUDIED	AVERAGE GRADES IN ENGLISH	NO. OF STUDENTS
0	77.26	53
1	79.27	41
2	79.57	66
3	80.64	28
4	81.88	26

It is clear from the table that the students who had studied Latin were slightly better in English composition than those who had not.

The significance of this fact is not clear, however, for one of the fundamental rules of experimental method has been violated. (See p. 383.) Harris made no attempt to control the initial ability of the five groups of subjects. In fact, we have every reason to believe that those students who elect Latin are, in general, more intelligent and better in all subjects than those who avoid it. Numerous studies have shown this to be true. Since Latin has the reputation of being a difficult subject, students who are lazy or dull avoid it. We are not justified, therefore, in taking Harris's data for evidence that students who have studied Latin will as a result do better in other courses.

The only proper technique in experimenting upon this problem consists first in taking two groups of subjects equal in all traits likely to affect the outcome, such as age, sex, intelligence, previous experience, interests, and *ability to do the task in question*; subjecting one group to the type of training supposed to have formal

disciplinary value, while the other group is given no such training; and, as the final phase, testing the two groups in a new task to see if the trained group is superior.

Hundreds of controlled experiments have been conducted to determine the limits of transfer of training.<sup>13</sup> This whole subject is too complicated for detailed treatment here, but some of the outstanding findings will be summarized for the student who wishes to improve his efficiency in learning.

① *Learn what you need to know.* All carefully conducted experiments show that transfer effects, when they occur, are too small to justify your learning one subject which you cannot use in the hope that it will help you with something you can use. If you want to go to Mexico, learn Spanish. Do not start by learning Latin or Greek, anticipating that it will "transfer" to Spanish. Students who have had two years of Latin will get more out of one year of Spanish than those who have not had Latin; but students who study Spanish for three years will know more Spanish at the end of that period than those who studied Latin one year and Spanish two years.

In the past the supposed disciplinary powers of arithmetic exercises were responsible for such monstrosities as the following:

A nail 4 inches long is driven through a board so that it projects 1.695 inches on one side and 1.428 on the other. How thick is the board?<sup>14</sup>

Suppose that in a life-situation you had a board with a nail driven through it. To get the essential data set forth in the above example, you would require a ruler, and if you had one, the simplest thing to do would be to measure the board directly.

In its present form, this problem seems ridiculous; but suppose you wanted to know how thick a panel is without tearing it out. Would the skill involved in this problem have some utility?

② *Learn methods and techniques.* How you study is more important than what you study in determining transfer. Woodrow conducted a well-conceived experiment in which three initially equal groups of college students were treated as follows: Group I was a control group which was tested for learning ability only at the beginning and end of the experiment and was given no special treatment otherwise; Group II practiced at learning various verbal

materials but was not told how to learn; Group III was instructed in the techniques of learning through the application of such rules as have been given in this chapter.<sup>15</sup> Group III showed the greatest improvement when tested at the end of the experiment.

In any given field of study there are special methods of studying which the student should learn. It is the function of the teacher to give training in the use of these methods. The study habits which make for success in chemistry will probably help in physics, but they are not the sort that are needed in literature courses. An engineering student once wrote in a review of *Gulliver's Travels*: "The Lilliputians could not have been as large as Swift said they were and still have as many of them stand on Gulliver as Swift said there had been." Such exactness in quantitative measurements is of greater use to the engineer than to the literary critic.

### <sup>2</sup> "Part" vs. "whole" learning

By "whole" learning is meant studying an assignment or repeating a passage to be memorized from beginning to end—as a whole. The "part" method breaks the material up into blocks which are mastered separately.

Psychologists have been studying the problem of "whole" vs. "part" learning for a half century. The problem is so complex that no one answer can be given. Hoskins found the two methods to be equal on the average for college students with short assignments of 1874 words as well as long assignments of 15,000 words.<sup>16</sup> Certain individuals did much better with the part method, while others found the whole method more effective.

### *Using the tools of the student*

The student has many aids available to him which he should make the most of for effective learning.

① *The dictionary habit.* No real student lacks the service of a good dictionary. When you encounter a new word, look it up. If you are engaged in the first reading of a textbook assignment, do not stop at that point to look up the word, for such a practice will interfere with the development of your interest and attention. Be content to note the word so that you can go back to it before you start the intensive second reading of the assigned

material. If you are reading for general interest, note the word as you pass it but wait until you are through with the article or chapter before you pause to look it up. Once you have looked up the word, reread the paragraph in which you found it to see how much your understanding of the author's idea is increased.

2. *Making lecture and reading notes.* Note-taking gives you a permanent record for review and also helps make lectures or reading assignments meaningful. Let us see how notes should be taken.



FIGURE 56. Students in the class of Dr. Norman Maclean at the University of Chicago have evidently learned Rule 1 for Taking Lecture Notes. Rule 1: Pay attention.

A. Good reading notes are readable. Don't hurry your writing so much that your notes become illegible. Notes are to be read when they are "cold." If you have learned shorthand, you are very fortunate, but you can otherwise develop a set of simple abbreviations to eliminate much of the mechanical labor in note-taking. Don't set down a series of suggestive phrases which will not be meaningful later. Make the complete statement in your own words.

B. Good reading notes are accurate. Notes properly taken can be referred to in the absence of the original publication. Be sure to check your notes against the text to make certain they are accurate. Otherwise their use would merely continue an error. If

you encounter a statement which you do not understand, take it down, but mark it with a question mark in parentheses.

*ans* c. Good reading notes contain complete bibliographic reference data. Remember that the ideas you gather in reading or from attending a lecture belong to some other person. You must be sure to label their source correctly. There are many forms of bibliographic reference, but the complete one must contain: the author's name and initials; the title of the book or article; the publication date and edition; the publisher's name. It is frequently desirable to include a statement of the number of pages and the price, as this can be done very simply if those items are available. Example:

Burns, C. D., "Which Way to Peace?" *London Mercury*, January, 1939, 39: 308-314.

Beard, C. A., and Beard, Mary R., *America in Mid-Passage*. The Macmillan Co., 1939. 977 pp. (\$3.50).

*d* Good notes are organized logically. All the lecture notes for a particular course should be kept together, regardless of the day of the lecture. The *ideas* are the important part, not the fact that a certain course comes on Mondays, Wednesdays, and Fridays.

Good lecture and reading notes are logically organized within themselves. Oftentimes you can improve the organization of the lecturer or author. Do so. The outline is a valuable device in taking notes. Use it.

There is no one correct outline for a given set of facts. The outline is for your use now and in the future. Its form will be determined by your needs and interests.

### *Concentrating*

Paying attention, like any other behavior, can be changed through learning. We have seen (p. 261) that attention is of three types. It is voluntary attention which is of greatest importance in studying. You can help yourself to maintain voluntary attentive adjustment if you know how.

✓ *Work while you work; play while you play.* An activity in progress sets us in the direction of further activity of the same kind. You can take advantage of this motivation in helping yourself con-



concentrate on an assignment. Prepare a program of your working and playing day. Stick to it. Your schedule should list all activities of the day, whether lecture, laboratory, student activities, recreation, meals, sleep, or just plain loafing. In preparing your program attempt to apply as many facts from this chapter as you can.

The following schedule is that of a very busy student who was successful in spite of having to spend part of his time in necessary self-support. You will notice that he did not go out for student activities of an organized sort other than the band, although he found time to loaf, to attend athletic contests, and to have dates. It is an

TABLE 25: *Work and Recreation Schedule of a College Student*

HOURS	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
12-6	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep
6-7	Dress	Dress	Dress	Dress	Dress	Dress	Sleep
	Furnace	Furnace	Furnace	Furnace	Furnace	Furnace	
7-8	Eat	Eat	Eat	Eat	Eat	Eat	Sleep
8-9	Math	Math	Math	Math	Math	Carry ashes	Dress
							Furnace
9-10	Rhet	Library	Rhet	Library	Rhet	Wash car	Eat
10-11	Chem	Library	Chem	Library	Chem	Scrub floors	Loaf
11-12	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Chapel
12-1	Work	Work	Work	Work	Work	Work	Loaf
1-2	Chem	Loaf	ROTC	Loaf	Phys Ed	Play with band at athletic events and similar occasions. Otherwise, Saturday afternoon and evening are free for games, hiking, or other recreation.	Dinner at House
2-3	Lab	Write chem report	ROTC	Write chem report	Phys Ed		Loaf
3-4	Chem Lab	Write chem report	Loaf	Write chem report	Loaf		Study at Library
4-5	Band	Study math	Band	Study math	Band		Study at Library
5-6	Band	Study math	Band	Study math	Band		Loaf
6-7	Dinner (House)	Dinner (House)	Dinner (House)	Dinner (House)	Dinner (House)		Loaf, or supper date
7-8	House meeting	Loaf or read	Loaf or read	Loaf or read	Loaf or read		
8-9	Study math	Study chem	Study math	Study chem	Date or movies		Loaf, or supper date
9-10	Study math	Study chem	Study math	Study chem	Date or movies		Study math
10-11	Furnace Retire	Furnace Retire	Furnace Retire	Furnace Retire	Date or movies		Furnace Retire
11-12	Sleep	Sleep	Sleep	Sleep	Sleep	Furnace Retire	Sleep



exceptional student who can excel in scholarship, athletics, and student activities and still find time for self-support. This student belonged to a fraternity, but he earned breakfast and lunch by waiting on tables at a student restaurant, and he paid for his room by taking care of the furnace in a near-by residence.

He was taking a full load of school work and allowed about two hours of preparation for each hour of work carried. His rhetoric preparation requiring the use of reference books was done at the library. His mathematics and chemistry were studied at home, because they required only a textbook. A student of less ability would require more than two hours of preparation and would be forced to carry fewer subject-hours or to drop some activity. Notice that the student arranged his schedule so that he did not try to study immediately after eating a heavy meal at noon or in the evening.

You will notice from his schedule that our student slept about seven and a half hours during the week, a little less on Friday and Saturday nights, but more on Sundays. On nights when he went to basketball games, he eliminated the period of loafing at his fraternity and missed about a half hour of sleep. He found that this program of sleeping worked well in his case. If he had required more sleep, he would have had to drop some of his daily activities.

✓*Remind yourself of your goal.* Remember the several studies reviewed in Chapter 6 which showed that success in scholarship goes with success in later life. The record which you are making in your studies right now will be a permanent one. It will be the basis for the granting or withholding of honors; it will be consulted by prospective employers in deciding whether or not you will be given an opportunity. There is much in college life besides study, but without study college is a pretty empty institution.

Set immediate goals. Be sure of course that they are attainable. Resolve to translate one page of French before getting up to stretch. The attaining of this sub-goal strengthens your resolve to attain the next. Keep up this process, and the main goal is eventually attained—the assignment is prepared. Thus, too, you can come closer to habitual attention in subjects not compellingly interesting.

✓*Assume an active attitude.* An active attitude in learning helps to build up motivation in the study situation.

Assume the proper bodily posture. Sit at your study table with your feet on the floor, your shoulders squared, your book firmly grasped as though you feared that someone would rob you of it. A firm posture is a good thing. Any tendency to excessive physical relaxation should be avoided during active study. Numerous bits of experimental evidence substantiate this advice.

Bills conducted an experiment in which he had subjects exert a mild muscular tension while learning.<sup>17</sup> The tension was produced by gripping an instrument known as the hand dynamometer, a device designed to test the strength of grip. Of course the subjects did not attempt to maintain their maximum grip. The results showed that those subjects who maintained a little muscular tension during learning were the most efficient in learning and in recalling. Stauffacher found that self-induced muscular tensions were more helpful to the poorer learners than to good ones.<sup>18</sup> You will remember in this connection that Wada found that mental work is done more efficiently during hunger contractions than at other times. These and related facts show that learning is facilitated by the presence of bodily tensions which are not too strong. Intense contraction of the muscles or intense hunger could easily serve as distractions to effective learning. Don't overdo it. Be content to maintain a firm body posture but do not permit yourself to strain as you study. Relaxation would be preferable to excessive tension.

✓ *Compete with yourself or others.* Keep a record of the number of pages of French or German which you can translate in an hour. Prepare a learning curve according to the directions given in the preceding chapter. Plot your performance for each study period. If you have a room-mate or some other friend taking the same course, have him do the same thing to add the element of rivalry to self-competition. In courses such as English composition where quality counts more than mere speed, keep a record of the number and kind of errors marked on your returned papers. Strive to eliminate the more frequent ones at first and notice the improvement in your marks. The encouragement which comes from this well-earned success experience will help you to further successes. (See Chapter 15 where the motivating power of competition is discussed in greater detail.)

*Practicing active recitation during study*

When you feel that you have mastered a certain paragraph or page, close your book and attempt to recite *in your own words* what you have learned. Then open the book and check your recitation for errors and omissions. An important psychological advantage of this method of study is that you are practicing the very behavior you will be graded on later; you force yourself to think and to organize your material. The following experiment by Gates proves to us the enormous value of recitation as an aid to learning and suggests a distribution of reading and reciting time during the study period.<sup>19</sup> Of course the exact proportions of each which should be used will depend upon the individual and on the nature of the material and must be determined by experiment.

Five groups of subjects learned nonsense and meaningful materials, each according to a different schedule of *reading* and *recitation*. The results are summarized in Table 26.

TABLE 26: *Relative Efficiency of Five Schedules of Reading vs. Recitation for Nonsense and Meaningful Materials\**

SCHEDULE	% OF NONSENSE		% OF SENSE	
	MATERIAL RECALLED		MATERIAL RECALLED	
	<i>Imme- diately</i>	<i>After 4 hrs.</i>	<i>Imme- diately</i>	<i>After 4 hrs.</i>
100% reading	35	15	35	16
80% reading, 20% recitation	50	26	37	19
60% reading, 40% recitation	54	28	41	25
40% reading, 60% recitation	57	37	42	26
20% reading, 80% recitation	74	48	42	26

\*The nonsense material consisted of 16 nonsense syllables; the sense material, a 170-word biography.

Study the table carefully. Notice that the programs calling for the expenditure of over half of the time in active recitation gave the best results in the case of both nonsense and meaningful materials. Note also that the beneficial results of reciting were apparent in both immediate recall and later recall.

*Spacing your learning effort*

There are various ways of distributing your effort in learning. Suppose that you have 100 hours in which to study a particular

subject, to learn the lines of a play, or to perfect yourself in some relatively simple motor act. You could study or practice ten hours a day for ten days, or you could work one hour a day for one hundred days. Many other variants are possible—two hours a day for fifty days, or a half hour per day for 200 days, and so on. All these schedules involve the same total amount of time devoted to study. Which of them will permit of the greatest and most permanent improvement per unit of time?

✓*Type of material determines spacing of effort.* The best way to space learning will depend upon the subject and the nature of the material.

Thirty years ago Starch conducted an experiment, recently verified, in which he compared four different methods of using two hours of time in learning code translation.<sup>20, 21</sup> One group of subjects practiced for ten minutes twice a day for six days; a second group practiced twenty minutes once a day for six days; a third group practiced forty minutes every other day for six days; and a fourth group practiced two hours at one sitting. The ten-minute-twice-a-day and the twenty-minute-once-a-day groups learned most effectively and were about equal in efficiency. The group which practiced two hours at one sitting was least efficient of the four; while the group which practiced forty minutes every other day was intermediate. For this type of learning, distributed practice appears to be more efficient than massed practice.

In the Starch experiment there were two variables, the length of the practice periods themselves and the length of the interval separating them. Pyle conducted an experiment, also in learning code translation, in which only the length of the practice period was varied, the periods being a day apart. The subjects practiced in fifteen-, thirty-, forty-five-, or sixty-minute periods.<sup>22</sup> They had previously been equated on the basis of their ability to learn during a sixteen-day period in which they all practiced under the same conditions. Here the thirty-minute practice period gave the most improvement per unit of time. The forty-five-minute period was next in efficiency; the fifteen-minute period was poorer still; and the sixty-minute period least effective of all.

It should be kept in mind that the code translation was nonsense material, the learning of which had no real value in the lives of

the subjects. Thus the experimental studies just described are more applicable to the memorizing of arbitrary facts than to the study of meaningful material. When subject-matter is interesting and meaningful, the superiority of the distributed practice declines or may even disappear. When the material to be studied is replete with new relationships to be seen and understood, the student might well devote more than an hour to its study at one sitting. Unfortunately, there has to date been a dearth of well-controlled experiments to determine the best length of study periods when interesting and meaningful material is to be learned. A close approach to the fundamental problem is seen in the work of Cook, who investigated the problem of massed vs. distributed practice in solving puzzles.<sup>23</sup> Psychologically, puzzle-solving is very similar to the study of mathematics and similar logical material for the learning of which the college student is held responsible. Cook found that massed practice is very much superior to distributed practice in this type of meaningful learning but that the superiority of the massed practice over the distributed declines as learning advances and the principal insights and understandings have been accomplished.

In summary, then, it can be said that when the study-subject is one which is interesting and full of opportunity to see new relationships, you can well afford to spend as many as two hours at one sitting. When the subject-matter involves rote learning of names, as in first-year language courses, anatomy, and closely related subjects, break your study periods up into shorter ones. A very good practice is to adjust your study method to the specific content of the course rather than to the course itself. When studying any subject to get the broad principles and relationships among the data of that subject, you may likely encounter detailed facts to be remembered; check them in the margin so that you can find them easily later but do not stop to attempt to memorize them at the moment. If you are certain that you understand them, go right ahead. After you have read the lesson for its general significance, go back and prepare a list containing the items to be committed to memory. Carry this list about with you and study it intensively for several periods of fifteen minutes distributed throughout the day.

Distribution of effort is especially important in learning motor skills. Travis studied the effect of rest periods on the learning of a complex eye-hand coördination.<sup>24</sup> With a constant practice period of five minutes he found a twenty-minute rest period to be more effective than rest periods of five minutes, forty-eight hours, seventy-two hours, or one hundred twenty hours. With practice periods of more than five minutes, longer periods between practice are required for highest efficiency in learning; with short practice periods, the inter-practice interval can be shorter and still obtain the maximum learning rate. There are limits, of course. In early practice, too long a rest period is extremely disadvantageous to learning.<sup>25</sup>

*Other factors to consider in spacing learning.* The factors underlying the superiority of a particular schedule of distribution of learning effort are very complex. Some of the more important ones will be discussed briefly.

A "Warming-up" period. We do not start right in to work the very moment we sit down at the study table. In the first place our materials must be brought out—the book opened and placed in a good position, the pencil sharpened, or the pen filled. Perhaps we broke off some very interesting activity to start preparing the lesson. This is not easily done, and there will be a period during which thoughts unrelated to study continue to pass through the mind. All this preparation takes time, but once it has been made, it need not be repeated during a particular study period. Obviously, the shorter the study period, the greater the proportion of it lost in getting started.

B Forgetting. Forgetting follows learning. If the practice periods are placed too far apart, even though they be of ideal length in and of themselves, the total schedule will not be an efficient one.

C. Boredom and fatigue. It is well-known to everybody that the most interesting activity becomes boresome if indulged in for too long a period at one sitting. Bridge is interesting, but you would not care to play it all day long seven days a week. A certain degree of variety introduced by changing from one subject to another serves to keep the interest fresh. Moreover, the muscles which maintain the posture of the body become tired from pro-



longed sitting at the study desk. These factors make it desirable that your own maximum length of time for efficient study be determined and then not exceeded.

### *How to remember*

The task of the student does not end with the learning of a subject-matter to the point of perfect repetition in an examination but only when the subject-matter has become so much a part of him that he uses it effortlessly in solving problems which come up in daily living. Then and then only can he say that he has "learned." Up to that time he has merely studied.

Eurich studied the retention of the content of a typical college course after a period of nine months.<sup>26</sup> At the end of this period the average score of the class was one which 97 per cent of the same class had bettered at the close of the semester's work. It was interesting to note that those students who knew the most at the end of the semester tended to remember the most. The conclusion from Eurich's experiment and others of a similar nature is that you tend to forget material unless you review it or use it. Much of what is taught in colleges has no practical value, or its value is not made apparent to the student.

✓ *Study with the intent to remember.* As you study, keep reminding yourself of the fact that you are going to be called upon to use what you are learning. Boswell and Foster in an early study required a small group of college students to memorize the Chinese equivalents of English words.<sup>27</sup> In one condition of the experiment the subjects were instructed to memorize for permanent retention. In the other condition the subjects were told to memorize for temporary retention. The same amount of time was spent in memorizing, but when instructions were to memorize for permanent retention both immediate and delayed recall were superior.

As you read the following story of the work of a bus driver, keep count of the number of passengers in the bus. Follow closely so that you can tell at any moment how many people are aboard:

A bus driver started with *one* passenger in his bus.

At the first stop four more got on and none got off.

At the next stop five got on, none got off.

At the next stop six got on, one got off.



At the next stop four got on, two got off.  
At the next stop seven got on, four got off.  
At the next stop four got on, six got off.  
At the next stop two got on, two got off.  
At the next stop nobody got on, two got off.  
At the next and last stop four got on and two got off.

Without going back to count, close your book and write down the exact number of stops the bus made. Do you remember? If not you have illustrated the importance of studying with intent to remember.

Review your material frequently. There is no doubt that frequent review will serve to bring a lapsing mastery of subject-matter or skill back to an efficient level of performance. Figure 54 shows the typical loss of retention as time passes. It is quite obvious from this curve that the greatest loss occurs immediately after learning. From this fact we can readily infer that an immediate review would be highly desirable. Jones conducted a significant experiment which shows that immediate review makes for more permanent retention of meaningful materials.<sup>28</sup> When a class lecture was listened to by students but never reviewed, the class recalled only 24 per cent of the items on a quiz given after a period of eight weeks had elapsed. But when the lecture was followed immediately by a five-minute review test, the amount of recall after eight weeks was 50 per cent better.

Many teachers are adopting the practice of conducting a short review quiz at the end of each class meeting. This procedure enables the student to determine his weak points for further study. Moreover, the fact that there is a quiz facing him causes the student to assume a more active attitude toward the material of the day's discussion. These factors together both increase learning and strengthen retention. The wise student takes advantage of a free period following a lecture to review what has been said that day before the material "gets cold."

The problem of how the review effort should be spaced in time is not so clearly answered. Despite the great practical significance of this point, no psychologist has investigated it adequately. We can, however, arrive at the answer by a process of reasoning. Many studies have shown that the longer knowledge has been main-

tained, the less it will decline in a given amount of time. Thus if the material is reviewed regularly, a shorter review period is required as time goes on to bring it back to the original level.

Review should be selective. We learn many things which we need not remember. Review should emphasize those points of greatest utility or of greatest difficulty. Modern practice in elementary school teaching is coming more and more to rely upon diagnostic tests to reveal the items on which the pupil needs special review and coaching. The use of such tests will prevent much useless recitation of facts which are already known and will free the pupil's time for learning new material.

Good diagnostic tests are lacking for most of the subjects taught in college, but you can get along fairly well by keeping a list of the difficult points in your assignments as you read through them. Points which are difficult at first are likely to be under-learned and hence easily forgotten. If you keep a list of your difficulties, you can use it for extra review.

It should be noticed, however, that certain subject-matters are self-perpetuating. Geometry, for example, is built up logically so that one principle depends upon another. In working with the higher principles the pupil inevitably reviews the lower ones by using them.

If you want to remember what you learn, use it as frequently as you can, learn with intent to remember, review it as frequently as you can, and cover the difficult part especially well.

### *Taking Examinations*

ALTHOUGH THE PRACTICE of examinations as conducted in our schools and colleges has been under considerable criticism for nearly half a century, examinations are still with us.

#### *Why have examinations?*

Examinations, whether written or oral, essay or objective, exert an undesirable effect on the student when they cause the student to work for grades rather than useful understanding of himself and the world about him. Examinations have also been criticized from the point of view of mental hygiene. Certain educators have

felt that the examination should be eliminated because it gives the individual a taste of failure and hence leads to feelings of inferiority. This objection is debatable. Perhaps adjustment to failure is something that we have to learn. No individual can be successful all of the time.

There are, however, certain values of the examination that cannot be overlooked. Some of these are discussed below.

Opportunity to coördinate work. We all need a little push from without now and then. The examination is valuable, because it forces you to review and organize the material in your mind, as you should do anyway but often wouldn't otherwise. If the examination accomplishes this, we should not worry too much about its artificial nature as an incentive.

Need for grading performance. We are living in a competitive society. We are always competing—in social situations, in athletics, in our work. We are going to be judged and graded whether we like it or not. Since this is so, the grading should be done fairly and objectively on the basis of an examination.

Examinations are necessary to protect society. Would you like to be operated on by a surgeon who had never shown his ability by passing a rigorous "State Board"? If you were an employer, would you hire an accountant or an engineer because he is "interested" in his subject? Most employers require proof of ability. The examination is a means of demonstrating your ability.

The examination is an indicator, not a goal. The good student is pleased to do well on an examination because the examination stands for something. The grade itself is valueless, but it symbolizes mastery of a subject-matter or skill.

Examinations properly used are diagnostic. They reveal the individual's strength and weakness. They tell which subjects are in line with his interests and abilities and can be very helpful in selecting a vocation, as we shall see in Chapter 14.

### *How to pass an examination*

An important personal problem of most college students is how to pass an examination. The rules are simple—if really applied.

Prepare for your examination. Here are the tools for your preparation.

A. Define the limits. Your instructor will announce the scope and limits of the examination. If he forgets to, ask him. You have a right to know in advance what race you are entering.

B. Study the instructor as well as the subject. If your instructor wants you to give back his ideas unchanged, do it. If he insists on such blind acceptance of his ideas, he is a poor instructor and should be avoided in the future, but your protest should not be made in the examination. The student should not be expected to agree with everything the text or the instructor says, but he should know most of it. More particularly, when he disagrees, he should know why. He should be able to prove his point. Most instructors will be elated to learn that a student can disagree and document his position with facts.

Read the questions before writing. Be certain that you understand the questions before starting to write. If you do not, ask for an explanation. You must get an over-all view of the examination if you are to divide your time properly and make the right emphases in your paper.

Outline your approach. Do not sit in despair. Get an idea in progress and many of the missing facts will come to mind. This procedure will also prevent your answering the question in a confused way.

Avoid emotion. Emotion comes when you have no ready response. Come to the examination as well prepared and confident as possible. This is the best way to keep your head in an examination. Emotion is closely related to physical condition, which requires a good night's sleep before an examination. To stay up all night trying to study usually makes matters worse.

### *Objective vs. essay examinations*

Psychologists have given close attention to the problem of marking students. It has been found that the old-fashioned essay examinations by their very nature can cover only a few points, although those few points are covered exhaustively. The element of chance is very important in determining scores earned on essay examinations. Two essay examinations over the same material will not correlate well with each other. Moreover, different instructors will disagree widely upon the marks to be assigned to a particular

examination paper. For example, in one study the same history examination paper was read by seventy history teachers.<sup>29</sup> One of them assigned it a mark of 43%, while another graded it 92%. The fact that two teachers could disagree so greatly indicates that essay examinations are not highly reliable. The essay examination does test ability to organize and interpret facts to a greater extent than does the objective examination.

The objective or short-answer examination is superior to the essay type, because it gives a more comprehensive sampling of the materials in the course studied. Of course there is some element of subjectivity in the preparation of the scoring key for the objective examination, but it is usually much less than that involved in grading essay examinations. Such an examination is apt to be more factual than the essay type. It is impossible to bluff on an objective examination.

One student summarized the two alternatives as follows: "If you want to do your own guessing and take the guesswork out of grading, take the objective examination. If you want the instructor to guess if your guess is right, take the essay examination."

When in doubt as to the type of examination you are going to have, study for an essay type. Meyer has shown that students who were instructed to study for an essay examination succeeded equally well on the two types. Students who were instructed to study for an objective and then took an essay examination were handicapped.<sup>30</sup> Students who expect essay examinations prepare differently from those who expect objective examinations.<sup>31</sup> In Meyer's experiment those expecting essay examinations made their material more meaningful; having done this, they were in a position to handle essay and objective examinations equally well. Students expecting objective examinations tried to pick out isolated points and memorize them, a method that ill-equipped them for the logical analysis required by the essay examination.

### *How to Get Along in the Laboratory*

MANY COLLEGES require one laboratory science to familiarize the student with the scientific approach. To many students who do not intend to specialize in the sciences, the techniques of the

laboratory are strange and confusing. Here are a few general principles for getting along in the laboratory.

### *Knowing what you are looking for*

The doctor who examines your blood for tuberculosis germs is not looking for just any kind of bacillus; he is looking for a particular type whose rod-shape has long been known. So before going to your laboratory, read the directions and read your textbook; not only will you find out, for example, that the tenth cranial nerve of the dogfish has its root in the medulla, but you will find out where it goes, what it looks like, what its function is—then you can find it in your specimen. You will save yourself much time by reading and knowing the directions in advance. Often several operations can be performed simultaneously.

### *Learning to observe and record facts precisely*

In the chemistry laboratory you are told that a certain acid solution will turn alkaline, as shown by the red litmus paper turning blue, when you add, for example, 3 c.c. of sodium hydroxide, a base. If you find you need only 2 c.c., don't attribute this to chance; there is some reason for it—a reason which you should investigate and report. When dissecting a dogfish in zoölogy, you will be expected to find ten cranial nerves. If you find only nine of them, don't conclude that your dogfish is abnormal. If you know where to look for it, you will find the tenth one.

### *Eye-hand coördination*

Not only do you have to think precisely; you also have to act precisely in the laboratory. Too deep a cut with your scalpel, and the nerve you were exposing in the frog's leg is severed. Precision is especially necessary in physics where calculations won't come out right unless you adjust and read your instruments accurately.

### *Patience*

Above all avoid getting upset and nervous. The experiments you perform can always be repeated if they fail the first time. You can prevent emotion in the laboratory by making your activity there smooth and meaningful. Emotion is an emergency reaction

and does not belong in the laboratory. Don't be concerned if Smith always finishes his laboratory work early; the important thing for you is to do your own experiment completely.

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Good study habits can be acquired by anybody who applies the laws of learning. Good management of learning effort involves the assuming of an active attitude toward your work. Work while you work; play while you play. And keep your goal in mind.

Inability to read is a frequent cause of poor learning in college students. This may be due to poor illumination which you can correct, or it may be due to defective vision which a physician can improve. It may be that your eye movements are faulty or that you vocalize too much as you read. In either case a psychologist can help you locate and correct your difficulty.

Many students fail because they do not make their lessons meaningful. Skim your assignment at first to get a bird's-eye view of it. Use the dictionary to look up unfamiliar words. Relate any new facts you encounter to old problems about which you have already thought. Translate the words of the textbook or lecturer into short summaries in your own language. Cross the boundary lines between subjects. All knowledge is related, and the more relations you see, the easier it is to learn. Don't try to study material too complex for your ability. Don't skip tables and graphs.

Space your learning effort. Cramming is a very inefficient way of learning for permanent retention. Guidance from experts in teaching should be accepted whenever it is available. Good guidance places explanation ahead of demonstration. Guidance should be had as early as possible and should not be too long continued. Do not rely upon formal discipline to strengthen your mind.

You can improve your memory for learned material by learning with intent to remember and by reviewing the material learned, especially through applying it to some practical purpose.

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The good student answers the questions on page 338 as follows:

(1) No; (2) Yes; (3) No; (4) No; (5) No; (6) Yes; (7) No; (8) No; (9) No; (10) No; (11) No; (12) No; (13) No; (14) No; (15) Yes; (16) Yes; (17) Yes; (18) Yes; (19) No; (20) Yes; (21) No; (22) Yes; (23) No; (24) Yes; (25) No; (26) No; (27) Yes; (28) No; (29) Yes; (30) No.



### *Recommended Readings*

EURICH, A. C. *The Reading Abilities of College Students*. University of Minnesota Press, 1931.

This volume contains the report on a series of experiments on teaching college students how to read.

HAWKES, H. E., LINDQUIST, E. F., and MANN, C. R., editors. *The Construction and Use of Achievement Examinations*. Houghton Mifflin Co., 1936.

This volume is aimed at the needs of the classroom teacher in schools and in the first two years of college. The authors stress the principles at the basis of examination making.

HEATON, K. L., and WEEDON, V. *The Failing Student*. University of Chicago Press, 1939.

A study of academic failure based in part on reports submitted by students themselves on objective psychological tests.

KATONA, G. *Organizing and Memorizing: Studies in the Psychology of Learning and Teaching*. Columbia University Press, 1940.

A study of the relationship between mechanical learning and learning involving understanding. The serious student will find many experiments and discussions of interest.

KORNHAUSER, A. W. *How to Study*. University of Chicago Press, 1937.

A booklet that fills a real need in setting forth direct suggestions to help college students improve their study habits.

McCLOSKEY, F. H., TERRY, J. S., and SCOTT, J. F. *What College Offers*. F. S. Crofts and Co., 1941.

An inspirational volume of essays on the subjects and purposes of college training.

RIGG, M. G. *Making Good in College*. Thomas Nelson and Sons, 1939.

This manual is designed to help the college student get the most from his college courses, with some emphasis on mental hygiene.

WOOD, E. E. *Mind and Memory Training*. Pitman, 1937.

Some interesting suggestions which may work for you but which should be subjected to careful experimentation before being accepted as science.

*"Thinkers are scarce as gold; but he whose thoughts embrace all his subject, and who pursues it uninterruptedly and fearless of consequences is a diamond of enormous size."* LAVATER

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## CHAPTER 11

# THINKING

*Thinking is talking to oneself—at least, most thinking. All thinking is done with symbols, the most important of which are words. From day-dreams of what might have been to solving a problem in calculus, thinking enables us to deal with a situation which is not present to the senses.*

TO THE LAYMAN there is a sharp difference between thought and action; to the psychologist there is no such clear distinction. Thinking is action. Learning, as you have seen, gives us power to adjust to changes in our present environment. Thinking goes far beyond even learning in aiding us to attain mastery over our environment.

Thinking is behavior in which at least some of the objects dealt with are not physically present to the senses or manipulated by the hands but are represented in consciousness by symbols. These symbols, however, are used in thinking in much the same way that we manipulate actual physical objects with our hands. Sym-

bols and the relationships among them are understood in thinking much as the relationships among physical objects are apprehended in observation. Symbols are many and varied in nature. Words, gestures, pictures are symbols.

## *Why We Think*

THINKING HAS an extremely important place in our daily activities. Just how important will be emphasized and illustrated as you consider why we think.

### *Kinds of thinking*

There are two extremes in kinds of thinking: (1) the kind that occurs when we are face to face with a problem which we attack mentally as a preliminary step to action, immediate or deferred; (2) the night-dreaming or the idle day-dreaming in which our desires are satisfied without action. In technical terms the first type is called *reasoning* and covers all types of problem solving, including creative imagination; the second, *autistic* thinking.

A little dreaming by day or by night is good for one. In fact, some inventors and artists report that a fundamental idea may come while they are in a dream. Such suggestions may be criticized and elaborated in the waking state. As a rule, however, our dreams do not stand the light of day. What seemed to be so wonderful an idea while we dozed is found upon critical examination to be poor indeed. You have seen too (Chapter 6) that individuals can give their thinking over to day-dreams which become so satisfactory in themselves that real satisfactions are no longer desired.

This unsatisfactory kind of thinking, however, represents only one end of a scale, with problem solving at the other end. The scale is a continuous one; our thinking may be at any intermediate point. In this chapter we shall be much more interested in reasoning and creative imagination than in the other type of thinking.

### *The results of thinking*

Ability to invent and to reason are typical characteristics of man which set him aside from the lower animals. Controlled thinking as preparation for the execution of any plan or enterprise or the

invention of instruments and techniques constitutes man's most important function in carrying out the work of the world. The physician, the lawyer, the architect, the engineer, the salesman, the teacher must spend many hours in thoughtful reflection in the course of executing their respective tasks.

*Thinking prepares for action.* Let us take a simple problem and see how it would be attacked thoughtfully and thoughtlessly. Let us assume that either method will give somewhat the same "answer." In following this comparison of the two fundamental methods of approach to a problem you will see that the thoughtful attack is enormously more advantageous than the thoughtless.

You have ten days to prepare for your final examinations in the four courses you are taking. How are you going to budget your time? You sit down and figure it out. "Now let's see: I don't have to worry about art; it's a snap. Just have to spend a couple of hours looking at the slides. I'd better do that the last day of the review period. Except that everyone will be looking at them then. I'll go at the beginning of next week. History is a tough one; I haven't done any of the outside reading. I'd better allow four days for the reading and an extra day to review my notes. In French I have to review, or learn, my grammar. That takes ages; and I have to learn some vocabulary, too. I'll have to count at least two days. And I'd better reread that Daudet book; he is sure to ask us to translate a passage from that. Well, that already makes eight days. I'll leave two days for psychology, to reread the text and do some of the outside reading which seems important. That just makes ten days. Oh, yes. I forgot that term paper in art appreciation which is about due; so I'll have to cut the history reading short. I had better stick to my schedule pretty closely if I want to get everything done."

A less thoughtful approach would be to grab your French grammar and keep on studying until you thought you knew it. And then suddenly stop and start your history reading, trying to cover book after book. At that rate you would be lucky if you got to your reading for psychology at all, much less finished it, and the art paper would probably go unwritten.

It should be apparent from the foregoing example that thinking may lead to action. By a process of thinking, many false steps are

eliminated, much waste avoided, numerous possible disasters averted, valuable time saved in the stages of behavior preliminary to the actual execution of a project.

*Thinking may end in new meanings.* By thinking, it is possible to work out new relationships between facts already familiar to us. This process of "putting two and two together" is an important part of the work of both the scholar and the man of science. Certain persons are best at discovering facts through research; others excel at arriving at meaning by putting together the facts which have been discovered. Within any field of learning there exists a great deal of this division of labor.

Let us take from the field of medicine a case in which thinking ended in new meanings. It had long been known that the disease syphilis can attack the nervous system to produce a form of insanity. It was also known that the natives of a certain community in Africa were one hundred per cent infected with syphilis; that they all had malaria fever; but that cases of syphilitic insanity were unknown there. One physician put these facts together. "Could it be," he reasoned, "that there is something in the reaction of the human body to malaria germs which renders the nervous system impervious to the effects of the syphilis germs?" That was one way in which the three facts could be put together. The hypothesis was tried out, and it worked. Insanity caused by syphilis can be arrested by giving the patient a slight case of malaria fever.

Not content, the medical researchers asked themselves, "Why? What kills the disease? Is it a chemical action, or is it the temperature?" Devices were developed to raise body temperature without giving the patient malaria fever. Cures were obtained. This is rapidly becoming the standard method of treatment in this disease in individuals who do not contract malaria when inoculated.

A further example is found in the case of Alfred Russel Wallace, who lay ill one day with a tropical fever, shivering between blankets though the day was intensely hot. It was only natural that his thoughts should turn to the problem of death and its causes. He recalled the Malthusian doctrine that population tends to increase in geometric ratio, while the means of subsistence increase in arithmetical ratio. Eventually there comes a time, Wallace reasoned, when the members of the group born cannot all live. He

recalled the fact that weaker animals perish in time of privation. Suddenly the two ideas came together in the principle of "survival of the fittest," which is an important step in the theory of evolution as it was worked out by Wallace and Darwin. A new meaning had been arrived at by combining familiar facts in a new pattern.

*Thinking may end in belief.* A belief is an emotional feeling which accompanies a verbal or other symbolic reaction. After the various facts have been considered, the person may label a conclusion as worthy of belief. The practical test of belief is willingness to act to prove or defend the belief. Not all beliefs result from rational analysis. In religion much is believed wholly or partly on faith. Certain facts or teachings are accepted as having been divinely revealed. Introspectively a belief arrived at through non-rational channels has about the same characteristics as one arrived at rationally. Once a belief or conviction has been established, it serves as a basis for the classification and evaluation of other facts. We shall see in the next chapter how our beliefs about practical problems are influenced by our emotional reactions. An over-emphasized and uncritical belief can often act as a deterrent to straightforward thinking.

*Thinking and perceiving compared.* The alert student has been putting the facts of thinking together with those set forth in the chapter on perceiving. A striking similarity is to be noted. Thinking and perceiving both culminate in action, meaning, and belief. How, then, do thinking and perceiving differ? The answer to this question has been suggested already. Perceiving is a process of organizing sensory data, whereas thinking, as has been said, can utilize items not present to the senses.

## *How We Think*

PSYCHOLOGISTS have entered into a great deal of controversy as to *how* we think. Since so much of our thinking takes the form of problem solving, we can best attack the problem at that point.

### *○ Trial and error vs. insight in thinking*

Trial and error is a process of trying first one solution, then another, until the best one is found. There is a time in the life of

every person when trial and error enters into the solution of even so simple a problem as adding two and three. The young child learns to solve his problem by manipulating small objects, such as beans, gum wads, his fingers, etc. When the problem becomes sufficiently routine in nature, no trial and error is necessary. Thinking, like manipulatory learning, may involve trial and error, except that in thinking the manipulation is of symbols rather than of objects.

Of recent years certain psychologists have made much of the fact that some solutions come suddenly and in the absence of observable trial-and-error manipulation of symbols or objects. Often there is a period in which no progress toward the solution is apparent, followed by a sudden arrival at the solution. This phenomenon is known as "insight."

Köhler conducted a series of experiments with apes in which the animals were placed in problem situations where materials at hand, if properly employed, could be used in reaching a solution.<sup>1</sup> The problems consisted in attempting to get food by the proper use of various materials placed in the cage. In one of these experiments he suspended a basket of fruit from the wire roof of the cage in such a manner that the basket could be made to swing back and forth by pulling a string. At one point of the arc described by the swinging basket was a scaffolding from which the basket could be caught by the animal. The basket could not be reached from the ground. At the beginning of one set of observations Köhler set the basket swinging and let three apes, Chica, Grande, and Tercera, into the cage. Grande attempted to reach the basket by jumping (a routine response) but failed. Chica had in the meantime looked over the situation and suddenly jumped to the scaffolding to catch the basket as it swung past. The interpretation put on this behavior is that Chica had "insight," where the other animal was employing trial and error. Before commenting on this interpretation it is well to consider another experiment, one conducted with children.

Alpert used similar situations with children of pre-school age.<sup>2</sup> In general the children did better than the apes. Some of them used trial and error, while others seemed to "size up the situation"



and then do the one right thing to get to the goal. For example, a toy would be placed far enough outside the play pen that it could not be reached. Some children would waste a considerable amount of time trying vainly to reach the toy, while others would seize a stick lying in plain sight and rake the toy in. The suddenness of the correct response and the lack of preceding trial and error are taken as signs of insight.

The interpretation of the work with the children and apes is difficult, because it was not known whether or not the subjects had had previous experience with the same sort of problem. If the subjects had previously worked out a similar situation by trial and error, it is quite possible that the original solution would be suddenly recalled and used. Such an occurrence would not properly be called insight. In the case of both children and apes the further possibility is that the solution was worked out by symbolic trial and error. The fact that the overt acts of the solution came suddenly would not afford unmistakable evidence of insight. Insight may be nothing more than sudden trial-and-error success.

The student who wishes to observe his own experience in this regard will do well to attempt the solution of the following problem. The answer will be found at the end of the chapter. Do not look at the answer until you are certain that the solution will not come.

Look at Figure 57. The diameter of this circle is two inches. One corner of the square is at the center of the circle. How long is the diagonal line?

Those of you who get the solution will notice that when it comes it comes very suddenly. Many students report that there is even here a preliminary period of trial-and-error solution which is eventually given up.

Trial and error and insight are not easily separated. Insight may come during an attack which started as trial and error and terminated in a sudden recognition of the adequate solution. On the other hand, the final solution may be arrived at by a sort of trial-and-error exploration of a series of hypotheses each of which comes by insight. Some of the best examples of insight and trial and error working side by side are to be found in the solution of mathematical problems.

### *1 The essential steps in problem thinking*

Dewey has analyzed the problem-solving type of thinking into its separate steps.<sup>3</sup> According to his analysis, slightly modified, there are five steps in the process of solving a problem. Sometimes we take one or more of these steps so rapidly that we scarcely know it. Sometimes we seem to take two of them at the same time.

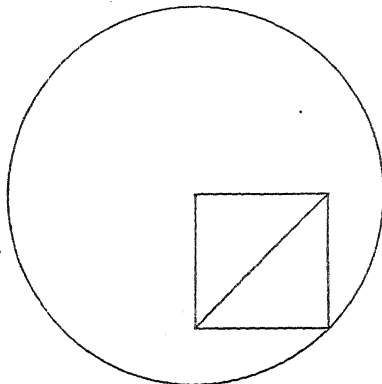


FIGURE 57. *How long is the diagonal line if . . . . . (see text and think).*

Nevertheless the five steps are there. Let us get these steps clearly in mind before following through an example.

1. *Problem.* Thinking must satisfy a need. The person who is completely satisfied will not think. There must be a distinct recognition of a want. Something must be lacking.

2. *Data.* There must be relevant data at hand or available from which to work. The more data available at the outset, the better. Steps 2 and 3 merge into one another, defying complete dissociation.

3. *Suggested solutions.* Any solution which fits the facts is worth evaluation. Suggested solutions or hypotheses arise from one's own past experience, from communication with others, or from the set-up of the problem situation itself. A person who is totally unfamiliar with the general type of problem which confronts him will have great difficulty in thinking his way to an adequate solution. The greater one's previous experience with the type of problem in hand, the fewer false motions will be made and the more accurate will be the final solution.

4. *Evaluation.* Further data pertinent to the suggested hypothesis are recalled and used as a standard against which the hypothesis is checked. Frequently this procedure will be sufficient to justify the discarding of the first hypothesis. In this case another hypothesis is suggested from past experience with related problems and is in turn subjected to evaluation by attempting to square it with the related facts as one knows them.

5. *The objective test or verification.* If the hypothesis passes all the tests imposed upon it through checking it against the known facts, the next step is action. The idea or plan is tried out and stands or falls on the basis of the results of the actual trial.

Here is an example of the use of these fundamental steps in problem solving. It is the description of an attempt to discover the purpose of the short metal chain which trails behind gasoline trucks.

Step 1. (Problem) What is the use of the short iron chain hanging down from the back of a gasoline truck?

Step 2. (Data) It is on all gasoline trucks; very rarely on other trucks. It is short, but long enough to trail on the ground. It is made of metal. Gasoline is highly inflammable. Trucks sometimes get stuck and have to be towed. Trucks sometimes pull trailers. Trucks running on icy pavement often use chains to prevent slipping.

Step 3. (Hypothesis) It may be used to attach a trailer to the truck.

Step 4. (Evaluation of the hypothesis) It is not long enough or strong enough. It would not hold the trailer back when going down hill. (This hypothesis is rejected.)

Step 3'. (Suggestion of another hypothesis) It may be just a spare chain, to use on the tires, or to fix something on the truck.

Step 4'. (Evaluation) Why keep it back there? Why not put it in the tool box? (Hypothesis rejected.)

Step 3''. (Suggestion of still another hypothesis) Maybe it has something to do with preventing the truck from catching fire and exploding.

Step 4''. (Evaluation) There is lots of friction in a truck, especially of the tires against the road. Friction generates static electricity. One of the sparks might ignite the gasoline. Something is needed to conduct that electricity to the ground. Metal is a good conductor. And the chain trails on the ground all the time. (Solution judged to be satisfactory.)

Step 5. (Objective test) Questioning of the driver shows the solution to be correct. The chain which drags on the road behind a gasoline truck

serves to drain off electric charges built up by friction and prevent sparks, which might otherwise set fire to the gasoline.

### *Creative thought of artists and inventors*

The creative thinking of the artist and the inventor is much like ordinary problem solving, although its steps are less clean-cut.<sup>4</sup> The introspections of artists give the following steps in creative effort: (1) problem; (2) preparation; (3) incubation; (4) illumination; (5) verification.

*Problem.* The artist or the inventor must have a task before him. This step is obviously the same as the first step in problem solving.

*Preparation.* Given the problem, there follows a period of preparation. During this period ideas shift rapidly. New ideas are examined and discarded.

*Incubation.* In the period of incubation an idea recurs spontaneously while the artist is thinking of something else. This phase may last from a few minutes to several years.

*Illumination.* The mood or idea which has been incubating is set down or sketched for the first time.

Preparation, incubation, and illumination all merge into each other. They correspond to the acquisition of data and the evaluation of suggested solutions in ordinary problem solving, except that the artist is attempting to convey a mood or emotion rather than to establish a logical relation. The artist works primarily with feelings rather than with facts.

*Verification or revision.* In this stage, details are changed until the idea is perfected. This stage in creative thinking is roughly the same as the fifth stage in problem solving.

### *The scientific method of thinking*

Like all thinking, scientific thinking starts from a problem. Data are then gathered and used to test the first suggested hypothesis, as in the example on page 380.

1. *The experimental method.* Sometimes it is possible to subject a hypothesis to a crucial test, i.e., to conduct some experiments which will decide an issue once and for all. This situation is rare in any science and is practically never encountered in the biologi-

cal and social sciences, where the phenomena investigated are complex and the obstacles to experimentation enormous. As a rule we simply go on adding more and more facts and modifying the hypothesis to meet them. Eventually the principle becomes known as a theory. A theory is simply a hypothesis which has been checked and rechecked. If a theory stands the test of all time, it may eventually come to be called a law. Fifty years ago science was prone to "law-making," but the recent upsets of some of our most cherished "laws" in physics and the other exact sciences have caused us to be more and more temperate in setting up theories as laws.

It should be noted that although contradictory evidence can disprove a theory, no amount of evidence can prove that the theory is true. Probability of truth is increased by confirming evidence—that is all. We can say, "If A is true, B will follow" and proceed to set up an experiment to see whether B does follow. Even if it does, however, we still are not justified in changing the argument to read, "B is true; therefore A must be true."

In their search for facts, with the constant aim of interpreting and organizing these facts, scientists must make their observations under certain stated conditions. This observing under stated conditions is called experimentation. The fundamental requirement is to let only one thing vary at a time.

Man is a great complex of interacting forces and events. What a person will do at any given moment depends upon his inherited traits, his past training, his physiological condition at the moment, what he was doing last, the nature of the environment present, and many other variables. The independent contribution of each of these variables in producing a certain behavior can be inferred only when it acts alone against a background of constant conditions. Much of our everyday thinking about human behavior fails to recognize and hold constant the significant conditions. When the answer to a scientific problem has far-reaching importance for human affairs, it is particularly necessary to interpret scientific observations correctly, to insist on the rule of one variable at a time. A striking example of the failure to do this is found in the mistaken inferences drawn from the records of the Edwards and Juke families.

By the year 1900 a total of 1394 descendants of Jonathan Edwards, the eminent divine, had been traced. Their lives and contributions to society were carefully studied. So outstandingly successful has this family been that it is frequently used to illustrate the importance of good heredity. Let us examine the statistics as given by Walter.<sup>5</sup> Table 27 shows the occupational status of the descendants of Jonathan Edwards. Those not listed in the table were women or successful citizens whose careers were less spectacular but entirely respectable.

TABLE 27: *Descendants of Jonathan Edwards*

| STATUS                   | NUMBER |
|--------------------------|--------|
| College graduates        | 295    |
| College presidents       | 13     |
| Physicians               | 60     |
| Clergymen                | 100    |
| Officers in army or navy | 75     |
| Authors and writers      | 60     |
| Judges                   | 30     |
| United States Senators   | 3      |
| Criminals                | 0      |

Now let us contrast this family history with the less inspiring one of the Juke family. Max Juke was a shiftless, illiterate, drunken backwoodsman who has given the world some 540 known descendants. Let us examine the statistics for them and see how they contrast with the descendants of Jonathan Edwards.

TABLE 28: *Descendants of Max Juke*

| STATUS                                                 | NUMBER |
|--------------------------------------------------------|--------|
| Paupers<br>(Total time in almshouses, 2300 years)      | 310    |
| Convicted criminals<br>(7 of these were murderers)     | 130    |
| Tradesmen<br>(10 of these learned the trade in prison) | 20     |

Over half of the female descendants were prostitutes. It is estimated that up to the year 1877 the known members of this socially inefficient family had cost the state of New York more than one and one quarter million dollars. The end was not then in sight, nor, indeed, is it now.

A comparison of these figures has frequently been employed by those who advocate controlled breeding as a means of improving the human race and sparing society the enormous costs of maintaining similar families of social incompetents. Such an impressive array of facts would seem to the uninitiated to indicate the potent force of heredity. The student should note, however, that the facts given do not satisfy the fundamental rule of only one varying condition at a time. The Edwardses had good heredity, but they also had good environment. The Jukes had bad heredity; but they also came from homes where drunkenness, poverty, crime, and prostitution were rife, conditions which do not constitute the ideal environment for the growing child. The dramatic comparison of the descendants of the two men has little or no value, then, except to attract interest to the fundamental problem involved and thus inspire efforts toward its solution. Perhaps, however, you are asking: "Well, what is it, heredity or environment?" The answer can never be given categorically, but ample opportunity will be presented later to examine the essential facts so that each reader can answer the question for himself with the necessary qualifications. The point we are concerned with here is that both heredity and environment varied between the Jukes and the Edwardses. Under those conditions we cannot know which of the two factors was responsible for the low degree of social efficiency of the Jukes and the high degree of social efficiency of the Edwardses.

2. The life-history methods. When experimental control would involve drastic interference with the normal development of the subject, say a child, this highly prized method must be foregone. One of the best substitutes for experimentation is the life-history method. The individual is studied at different stages in his life in order that we may trace his development. There are three life-history methods.

A. The daybook method. The child's development is carefully watched and recorded day by day. This is usually done with the aid of standardized recording sheets, although such forms are not necessary. Many a mother keeps a daybook of her child's development, employing for the purpose any ordinary note-book. Such a



daily record will contain descriptions of when the baby first sat, stood, and walked, his first word, his first smile, etc. It goes without saying that the careful observer will date every note entered in the book and will enter the notes and remarks as soon as possible after making the observation. The human memory is notoriously faulty and not to be relied on, except when necessity leaves no other course. Such records, when compiled in sufficient number, give us standards by which to judge the normality of the development of other children.

B. The clinical method. The clinical method represents an elaboration and extension of the daybook method. It is essentially a developmental method in which the life history of a person is reconstructed on the basis of any information available, in an effort to discover the cause of, and solution for, some emotional-adjustment problem. Clinical psychology is rapidly becoming a recognized profession. The most effective psychological clinic is made up of three persons of professional status: a psychiatrist, a psychologist, and a social worker. The psychiatrist examines the individual for signs of physical and mental disease; the psychologist tests his intelligence and other mental abilities; then the social worker examines the home conditions which surround and have surrounded the growing patient. The final step in the examination is a meeting of the three members of the clinic where each reports his findings in relation to the emotional-adjustment problem, and the three work out some plan of treatment. The work of the clinic is not ended when the full record of the conditioning influences in the person's life has been obtained. A good psychological clinic provides for treatment of some cases and a follow-up of the others to see that the recommendations have actually been observed, and to report on the progress or lack of progress shown.

The clinical method originated in connection with efforts to adjust problem children and social misfits, particularly as they are encountered by the juvenile courts. The method is showing itself to be of such great value that its application is rapidly being extended to borderline or "difficult" children who are not actually delinquent or abnormal but who are perhaps on the road to that condition. It is not unreasonable to suppose that eventu-

ally we will have "normal child" clinics to give parents advice on the care and training of their children, or even "marriage clinics" to help adults select their spouses and to give help and advice on adjustments in marriage.

c. The biographical method. The biographical method is simply an attempt to apply the clinical method to the records of men's lives as set down by themselves or others. There are certain important limitations to the application of the clinical method to biographical materials. In the first place, such accounts are never complete. The biographer is not a psychologist and does not recognize the importance of seemingly trivial incidents in determining the mental quirks of a human individual. In the second place, we have the matter of the author's motivation. Why should a person bother to set down the seemingly trivial occurrences of his life or the life of some other person? He is frequently motivated by the urge, recognized or unconscious, to praise or blame. The biographer strives to be impartial, but his interest, if sufficient to motivate the writing of the biography, will probably lead him to take sides. Literary biographies are at best a poor substitute for first-hand study, but where the latter is impossible, they have their place.

Summary of the scientific methods. Psychology, like any other science, attempts to observe and interpret its facts along well-ordered lines. The psychologist attempts to make his observations under the controlled condition of the experiment in which only one determining influence changes at a time. When more than one determining influence changes at a time, he is unable to pick out from all of them the one which is the cause of the behavior in question. In situations where direct control is not possible, the psychologist uses life-history methods. These latter methods permit the study of certain phenomena of human nature which cannot be approached in any other way.

### *The tools with which we think*

How are ideas represented? How can a person in the United States think about the political situation in the Orient? The Orient is far from our senses. In this section you will see how physically present stimuli can serve to represent absent objects.

The absent objects thus represented by physically present stimuli are called ideas. You will see how ideas grow and learn what the carriers of ideas are.

*Imagery in thinking.* A half century ago psychologists were deep in a controversy over the problem of imageless thought. Some individuals held that thought required the use of images or mental pictures of actual sensory experiences such as sights, sounds, and smells. Subsequent discoveries force us to abandon the notion that images are the only materials with which we think. Many persons report that they can solve problems or even dream without the use of images. We cannot, of course, deny that recalled facts are necessary to thinking. The point is that people who do not have imagery or who have very little of it recall their facts through words or other symbols.

Sir Francis Galton made a study of the kinds of visual images used by people in thinking.<sup>6</sup> He questioned many people in various walks of life, including a number of great scientists of his time. His detailed analyses of the descriptions of the imagery experienced by his subjects revealed that those very persons who were engaged in the highest and most complicated type of thinking, such as mathematical analysis, are likely to be deficient in visual imagery. For example, Poincaré, the great French mathematician, was very poor in visual imagery. Less gifted persons and children, on the other hand, often possess clear visual imagery to a much higher degree. This fundamental fact would seem to cast doubt upon the proposition that all thinking involves the use of visual imagery.

A. The rôle of imagery in mental life. Although there is reason to believe that images are not the only carriers of meaning in thinking, there are, nevertheless, certain types of problems in which the ability to visualize is of great value. Take an example:

You are in a city laid out in equal blocks in both the north-south and east-west direction. Starting from point A, you walk three blocks to the south. Then turn left and walk seven blocks. Turn left again and walk two blocks. Turn again and walk four more blocks to the left. Then make a right turn and walk one block, and after this walk three blocks to the left. How many blocks are you from where you started?

Fox made a careful study of the conditions under which mental images are aroused in thought. He came to the conclusion that images occur in greatest numbers when the situation does not permit action or when movement is difficult and that few images occur when action is easy and routine.<sup>7</sup> Images are typically much stronger in dreams than in the adaptive activity demanded by the needs of the day.

People vary greatly in the strength of their images. Most people seem to be strongest in visual imagery. Some, however, are strongest in their "mind's ear"; a small minority find that images of touch, muscle movement, taste, or smell are strongest. In rare cases, individuals possess powerful imagery which is almost like actual perception in its clarity and accuracy. These strong images, usually visual, are called eidetic images. People with eidetic imagery can frequently tell the exact position of a formula or fact on the printed page of the textbook. They can even glance for a fraction of a second at an object, such as a comb, and then call up the image and give a complete description such as the number of teeth in the comb as presented in imagery. In examinations they copy from their image of the printed page, thus keeping within the rules of the game but performing with an accuracy as great as if the book were actually open before them. Eidetic imagery is most often found in children; they lose much of it as they grow older.

An example is the case of a law student who was haled before a discipline committee on the charge of cheating in an examination. One of the questions called for the details of a law case which was given in the textbook. The student had turned in a description which was word for word that of the textbook. The reader had quite naturally concluded that the student had followed an open copy. Upon being questioned the student defended himself by saying that he had felt that the professor might call for that case and so had looked it over just before class. To test his ability at such exact reproduction of verbal material, the student was given a page of unfamiliar material to study for five minutes. At the end of that period he was able to reproduce some four hundred words without error. Not a single word or punctuation mark differed from the text. Further investigation revealed that this person had eidetic imagery.

B. The enjoyment of imagery. Life may be a struggle, but there are many times when we let ourselves rest from the serious business of merely keeping alive. At those times the joys of vivid play of mental images are real and worth while. Think of someone who is dear to you. Can you get an image of that person's face? Can you hear the sound of his voice? Try to relive in imagery the sight of some scene from nature, an interesting barn or farm-house, the mosaic of green, brown, and blue of the farm by the ocean as seen from an airplane. *It is good sport.*

Joseph Conrad has set down in writing the scenes which he relives in imagery.

... I remember nights and days of calm, when we pulled, we pulled, and the boat seemed to stand still, as if bewitched within the circle of the sea horizon. I remember the heat, the deluge of rain-squalls that kept us bailing for dear life (but filled our water-cask), and I remember sixteen hours on end with a mouth dry as a cinder and a steering-oar over the stern to keep my first command head on to a breaking sea. I did not know how good a man I was till then. I remember the drawn faces, the dejected figures of my two men, and I remember my youth and the feeling that will never come back any more—the feeling that I could last forever, outlast the sea, the earth, and all men; the deceitful feeling that lures us on to joys, to perils, to love, to vain effort—to death; the triumphant conviction of strength, the heat of life in the handful of dust, the glow in the heart that with every year grows dim, grows cold, grows small, and expires—and expires, too soon, too soon—before life itself.

And this is how I see the East. I have seen its secret places and have looked into its very soul; but now I see it always from a small boat, a high outline of mountains, blue and afar in the morning; like faint mist at noon; a jagged wall of purple at sunset. I have the feel of the oar in my hand, the vision of a scorching blue sea in my eyes. And I see a bay, a wide bay, smooth as glass and polished like ice, shimmering in the dark. A red light burns far off upon the gloom of the land, and the night is soft and warm. We drag at the oars with aching arms, and suddenly a puff of wind, a puff faint and tepid and laden with strange odors of blossoms, of aromatic wood, comes out of the still night—the first sigh of the East on my face. That I can never forget. It was impalpable and enslaving, like a charm, like a whispered promise of mysterious delight.<sup>8</sup>

Through the recall of images in our various sense departments we are able to enjoy situations far removed in space or time.

Auditory stimuli may often give rise to visual imagery. There are no absolutely fixed relationships between visual imagery and the nature of musical stimuli, but certain tendencies are observed.<sup>9</sup> A rise in pitch or quickened tempo usually brings increased brightness of the image. Smooth music brings graceful, flowing lines in the visual images; syncopated music gives rise to jagged lines.

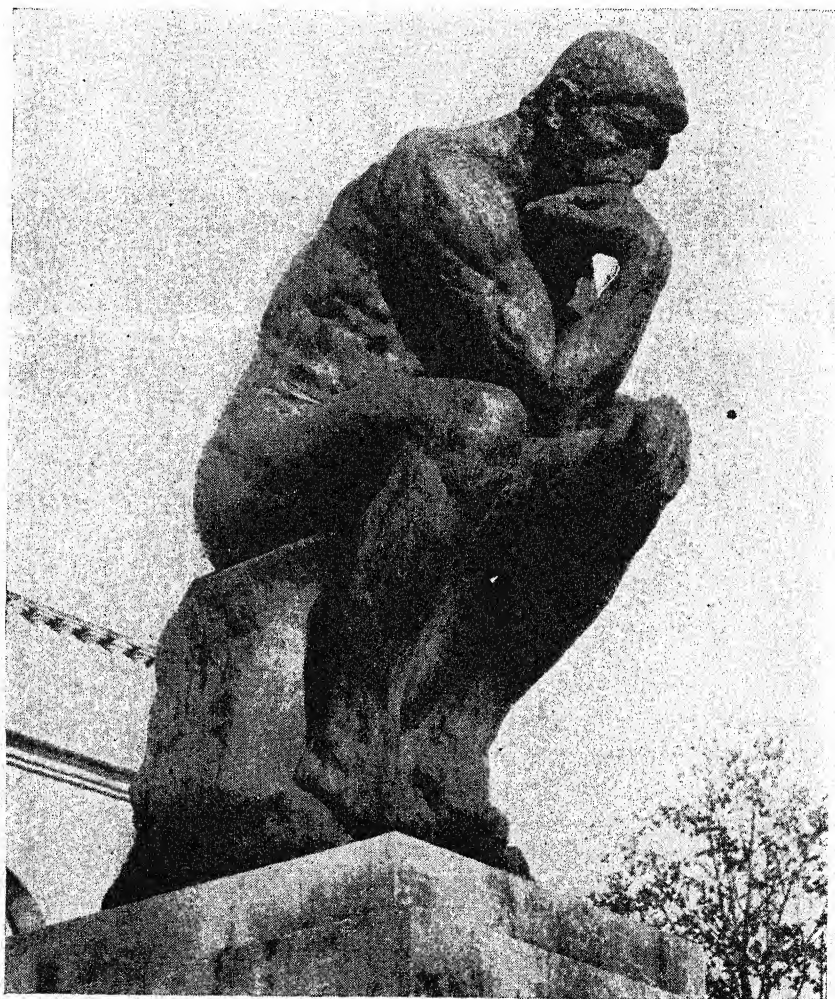


FIGURE 58. *Psychologists as well as artists feel that Rodin has caught the thinker—any thinker—in this work. But don't conclude that you are quiet as a statue when you think.*



Different instruments give rise to lines of different color. Increases of volume bring increased area of the images. About half of the adult population enjoys such colored hearing when listening to music or other sounds. Many subjects have colored images even when recalling music which is not being played. All of this enriches life by adding to the enjoyment of imagery.

*Mature thought uses word symbols.* There are other tools in thinking which play a larger part than do images. These are most obvious when they are working at low speed, so to speak. Notice the child who is trying to read. You will see that his lips move as he pronounces the words to himself. An adult of low intelligence will behave in much the same way. Even the intelligent and educated adult will vocalize noticeably in reading a foreign language with which he is not very familiar. This would seem to indicate that words are used in thinking. There is good reason to believe that thinking which uses words and other symbols, such as those of the mathematician, represents a more mature stage of mental development than that employing images, since, as we have seen, children usually have stronger images than adults, and superior adults have weaker imagery than adults of mediocre intelligence.

*Implicit speech movements.* We have often observed people in deep thought whose lips were motionless and silent. What about them? Can they be talking to themselves? This is a fundamental point. Several psychologists have attacked this problem by fitting sensitive recording apparatus to the lips, tongue, and voice box. Subjects were instructed to read poetry or other material to themselves silently.<sup>10</sup> Most of the subjects showed movements of the speech apparatus which were too small to be detected by the senses unaided but still large enough to affect the sensitive recording apparatus. Clearly, these highly reduced, or implicit, speech movements are possible carriers of meaning in thinking.

*Other implicit muscular movements in thought.* Many persons have challenged the theory that thinking is accomplished by highly reduced movements on the basis that the characteristic posture in thinking is one of inaction. Look at Figure 58, the photograph of the famous statue by Rodin, "Le Penseur." Notice that the figure reveals no trace of outward activity. He seems to be entirely lost to the world of deeds. To conclude, however, that implicit muscu-



lar responses are absent would be decidedly naïve. Fortunately, we have experimental evidence that tiny movements too minute to be seen by the human eye unaided do go on during thought.

It has long been known that contracting muscles produce tiny electric currents. For a long time the problem confronting physiologists was how to amplify or magnify these tiny electric currents to such a stage that even the momentary twitch of a tiny bundle of muscle fibers could be recorded. The development of radio tubes solved this problem. Amplifiers are now available which will pick up the tiny electric impulses of a contracting muscle of the wrist and translate them into sound which reminds one of a flight of heavy bombing planes taking off. In fact, apparatus of this sort has been made so sensitive that it is necessary to train subjects in a special technique of relaxation so that their incidental movements will not interfere with the study of the special movements occurring during thinking.

Definite correlations in time have been established between an act of thought and the appearance of tiny muscular movements. Jacobson recorded the action currents of the muscle and skin at the elbow of the *right* arm during the following conditions:

Imagine bending *left* arm  
Actually bend left arm  
Imagine right arm perfectly relaxed  
Do not bother to imagine<sup>11</sup>

The action currents under these conditions were those of the resting state. When, however, the subject was asked to imagine movements of the *right* hand, action currents occurred even though the arm did not move perceptibly.

The results of Jacobson's experiments have been confirmed by many others. Totten has shown that the eyes actually move, when thinking of a geometric design, to outline the form of it.<sup>12</sup>

There is no doubt that thinking of some act is correlated with action currents appropriate to the muscles that would be brought into play by that act. This is true whether images are present or not. There is still lacking acceptable evidence of the direction of cause and effect. Logically, it is as possible that the thought caused the implicit movement as that the implicit movement is a necessary

condition or cause of the thought. Jacobson found that subjects could not imagine while relaxed. This is consistent with the interpretation that tiny muscle movements are essential to thinking but not conclusive proof. It might be that thinking always *causes* tiny muscle movements. The final proof of this relationship would come only if the time sequence of the two things could be established. A cause must always precede its effect. There is, however, no evidence conflicting with the hypothesis that the tiny muscle movement is necessary to thought.

### *How We Learn to Use Language*

IN COMMUNICATION, overt speech plays a far more important rôle than do other gestures or images. The human baby starts during the second part of his first year to acquire organized speech. This process continues into early maturity. The pure mental image has no value whatever in communication. Images to be used in communication must be translated into words or other gestures. Under these circumstances it is only to be expected that overt language responses, since they are so highly practiced, would lend themselves to reduction and consequent use in both thinking and communicating better than other types of muscular response. In this section we shall see how language organization is built up through years of contact with the social environment.

Speech sounds are produced by a pattern of contraction of the muscles of the chest, diaphragm, vocal cords, tongue, and lips. An exact description of the complex anatomy and physiology of the human vocal apparatus and the even more complex study of the physical analysis of the sound elements in human speech must be reserved for advanced courses in the science of phonetics.

Like those of other muscular groups, the responses of the organs of speech are subject to voluntary control and are readily reorganized into new and complex patterns. Responses of the vocal organs serve to stimulate other people and oneself as well. Our speech organs stimulate others through the sounds produced. They stimulate us both through these sounds and through sensations from the muscles of our own vocal apparatus. Thus thinking, as you will soon see, is a chain of self-stimulation and response.

### *How sounds and words get meaning*

A meaning or an idea is some absent object, situation, event, or relationship represented by a present symbol, such as a word or gesture. The word or gesture can be explicit or implicit depending on whether the meaning is communicated or only thought. Students of infant behavior have been able to differentiate seven phases in the development of language. The first and second of these are definitely limited to the production of sounds which are not meaningful in the sense of representing absent objects or events. Early stages in language growth overlap succeeding ones. One is not completed before the next begins. For this reason it is impossible to establish exact age limits of the different phases.

*The reflex stage.* The new-born child is capable of producing sounds of a purely reflex nature. He cries, coos, sneezes, and gurgles and wheezes. The sound *ma* is among those which appear during the first thirty days of life and is frequently made during the first year. Sounds are made quite spontaneously in the sense that they are provoked by some internal stimulus, the nature of which need not concern us here. Such sounds may have meaning for the adults who are caring for the child, but to the tiny infant they are presumably meaningless.

*The age of imitative babbling.* Now suppose that the child of about one year of age is responding to this internal but adequate stimulus at the time the mother's face comes into view. The mother rewards the child when he "happens" to say *mama* by smiling at her infant, by petting him, or by picking him up. In this simple way the child learns to say *ma*, *ma* at the sight of the mother's face or at the sound of her voice. There is another important element in this learning situation, however. As the child makes the vocal response of *mama*, he hears his own voice. That is to say, auditory stimulation is present. Thus, the sound of the baby's own voice brings forth the series of *ma*, *ma*, *ma*, *ma*'s which babies so frequently indulge in. Each response produces a sound which serves as a stimulus to the next response. Suppose that the mother or some other adult joins the chorus of *ma*, *ma*, *ma*'s. The sound of the other person's voice becomes a stimulus to the response by the same process of conditioning that was just described.

Let us now take a child who is nearing the end of his first year of life. He has learned to pick up favorite toys. Now suppose that just as the child is about to pick up his doll, we say: "Pick it up. Pick it up." Under these conditions the sound of the words "pick it up" comes to serve as a stimulus to the response which was originally evoked by the sight of the object itself. If, in similar fashion, the child is told to "brush hair" at the time his hand is finding its way to the hair, this connection is established. Much of the playful attention which the mother devotes to her baby in its early years of life is devoted to teaching the child to name objects and to execute simple acts of the sort described.

*The plateau stage.* After a period of growth in imitative babbling there is frequently observed a period in which little language growth appears. This is the *plateau* period, during which the child vocalizes less and spends a great deal of time in efforts to walk. It has been suggested that the speech plateau is caused by actual interference from walking activity over and above the mere delay in progress due to concentrating on something else. That skilled acts interfere with one another in the early stages of their acquisition is a well-founded generalization concerning human behavior.

*The dawn of meaning.* After the child has learned to walk, we notice many evidences of the meaningful use of words. Eventually the child will be able to execute simple commands, such as "Bring me your doll from the basket." At this point we can definitely say that symbolic behavior is present. The child who hunts for the absent object is responding symbolically. The physically absent object is represented by some present symbol in the child's consciousness, and the spoken command, serves to direct the child toward the absent object. In the second year of life many new meanings arise, and their number augments in geometric progression as the months pass.

*The stage of expression.* Once a few meanings have been acquired by the child, the development into the stage of expression is quite rapid. At first present objects are named. Soon the child will use words to stand for absent objects. This is the essence of true expression. By the age of three years the average child is something of a conversationalist. His 1000 words are used in simple sentences to request and to convey information.

*The growth of concepts.* In the first meaningful use of words the word is a symbol standing for some single absent object. Words thus used are concrete and not abstract. As the child grows older, the process of concept formation becomes more and more prominent. A concept is a word or other symbol which stands for the common property of a number of absent objects, acts, situations, or events. Such abstract signs cannot refer to a property capable of independent existence. Let us take some examples of the growth of concepts.

A little girl at the age of two years was accustomed to playing with the following group of objects which she and the adults around her called balls: golf balls; several rubber balls of different sizes and colors, some hard and some soft; tennis balls; a large inflated rubber ball about the size of a basketball. On a particular occasion her father was reading a copy of a popular magazine which in its reviews of plays, motion-picture films, and other amusements rated them by the use of red, yellow, and blue dots placed opposite the titles. With the enthusiasm of one who had made a great discovery, the little girl cried, "Ball! Ball!" pointing to the colored dots. Here we have a simple example of the end result of a process of conceptualization. The fact that the concept was imperfect as judged from adult standards does not lessen its value as an illustration. The dots on the printed page and the balls of the child's acquaintance all possess the common property of having a circular outline. It was this element which presumably evoked the verbal response of "ball."

To test whether a series of experiences has been abstracted into a unifying concept, we simply present to the child an object new to him but possessing familiar characteristics. If the child labels the new object in terms of its element common to the familiar ones, the test is passed.

Much of the education of an adult consists in his learning to employ abstractions or concepts in his thinking. Mass, velocity, energy, time, distance, and inertia are concepts essential to physics. Other organized bodies of knowledge have similar lists of basic concepts. Concepts are always derived from primitive experience with existing things, but they represent no one thing capable of independent existence.

Concepts will be most useful when they are well rounded and precise. In general, the more elements of experience which go into a concept, the more useful and exact that concept will be. When the primary data are incomplete or false, the concept which summarizes them will be defective. How sharply a concept should be defined depends on the use to which it is put. In certain situations and for certain purposes alcohol is alcohol. For example, if you have either methyl or ethyl alcohol on hand in sufficient quantity, you can pour it in the radiator of your car to prevent freezing. In such a situation the difference between the two substances would be unimportant. The difference between the two would, however, be very important to a pharmacist who was preparing an elixir on prescription. In that case ethyl alcohol is the precise concept. Less precision than that would lead to bad results.

Technical terms are employed in science and in every type of accurate thinking, because the concepts they represent are precise. The limits of the concept have been sharply drawn and agreed upon by experts in the field. The meaning of the term is clear to everybody.

Much misunderstanding arises because of failure to employ definite terms. We react not to what people actually say but to what we understand them to mean. A missionary to the Congo natives wanted a word for "*table*." He attracted the attention of a group of boys and tapped a table saying, "What is this?" He got five answers: *etanda*, *dodela*, *bokali*, *clamba*, and *meza*. These words are not synonyms. One boy had given the word for *hardness*; others gave the name of the material and the verb for *tapping*; one gave the name of the table *covering*, and only one gave the word for *table*. Every response was appropriate to the situation, but much confusion could have resulted unless several situations were presented and labeled until the essential concept was defined.

The explanation of the evolution of concepts is consistent with the characteristics of conditioning. In a series of situations in which objects are labeled, the common element is present every time and hence enjoys the advantage of more frequent repetition. Also the common element is the one which invariably goes with the satisfaction of the need for a label. In other words, the com-

mon element and the term standing for it are reënforced by each experience, whereas the special element may or may not be present.

### *The growth of vocabulary*

So much of our thinking employs words that it will be helpful to examine some of the quantitative studies on the growth of language and meanings among children.

*Age increases in the size of the vocabulary.* M. E. Smith made a very comprehensive study of the words which could be used meaningfully by children ranging in age from eight months to six years.<sup>18</sup>

TABLE 29: *Size and Increase in Use Vocabulary of Children up to Six Years of Age (From Smith)*

| AGE            | NUMBER OF<br>WORDS | GAIN | AVERAGE<br>I. Q. | NUMBER OF<br>CASES |
|----------------|--------------------|------|------------------|--------------------|
| 8 mos.         | 0                  | 0    | ...              | 13                 |
| 10 mos.        | 1                  | 1    | ...              | 17                 |
| 1 yr.          | 3                  | 2    | ...              | 52                 |
| 1 yr., 3 mos.  | 19                 | 16   | ...              | 19                 |
| 1 yr., 6 mos.  | 22                 | 3    | ...              | 14                 |
| 1 yr., 9 mos.  | 118                | 96   | ...              | 14                 |
| 2 yrs.         | 272                | 154  | ...              | 25                 |
| 2 yrs., 6 mos. | 446                | 174  | ...              | 14                 |
| 3 yrs.         | 896                | 450  | 109              | 20                 |
| 3 yrs., 6 mos. | 1222               | 326  | 106              | 26                 |
| 4 yrs.         | 1540               | 318  | 109              | 26                 |
| 4 yrs., 6 mos. | 1870               | 330  | 109              | 32                 |
| 5 yrs.         | 2072               | 202  | 108              | 20                 |
| 5 yrs., 6 mos. | 2289               | 217  | 110              | 27                 |
| 6 yrs.         | 2562               | 273  | 108              | 9                  |

Evidence on vocabulary growth from grades one to twelve is presented in an unpublished study by M. K. Smith, who used the Seashore-Eckerson English Recognition Vocabulary Test. Table 30 shows her data, based on a test sampling all of the words in the English language. A word was considered in the subjects' vocabulary if they could pick a synonym for it from four possibilities. These vocabulary scores are, of course, not comparable to those in Table 29.

The ability to learn the meaning of new words continues throughout life. Although older people are slower than younger



TABLE 30: *Size and Increase in Recognition Vocabulary between the First and Twelfth Grades* (From Seashore and Eckerson)

| SCHOOL<br>GRADE | AVERAGE<br>BASIC VOCABULARY | SCHOOL<br>GRADE | AVERAGE<br>BASIC VOCABULARY |
|-----------------|-----------------------------|-----------------|-----------------------------|
| 1               | 16,900                      | 7               | 33,800                      |
| 2               | 21,900                      | 8               | 37,100                      |
| 3               | 25,600                      | 9               | 37,900                      |
| 4               | 28,400                      | 10              | 43,100                      |
| 5               | 25,600                      | 11              | 44,900                      |
| 6               | 34,000                      | 12              | 47,300                      |

persons in learning new words, they continue even past the age of sixty years to increase in verbal facility as measured by words whose meanings can be recognized.<sup>14</sup>

*Age changes in the composition of the vocabulary.* The two foregoing tables show quite clearly that vocabulary increases with age and experience. Even more pertinent to our present discussion is the fact that the proportions of the different parts of speech show significant changes with increases in age and experience. McCarthy analyzed the words used by children between eighteen and fifty-four months of age.<sup>15</sup> At age eighteen months nouns constituted 50 per cent of the children's total vocabularies, but their proportion decreased to about 19 per cent at fifty-four months. The verbs used increased over this age-range from 14 per cent to 25 per cent. Adjectives also almost doubled in relative frequency between the ages considered. These figures reflect a tendency toward less sheer naming and more qualification of objects.

*Age differences in the precision of the meanings of words.* As the child grows older, there is a progressive change in the precision of the meanings of words. Nuances which were beyond the scope of the young child creep into adult usages of words and phrases. Barnes asked the 1400 children of a London school to give a definition of the word *emperor*.<sup>16</sup> The complete answer was taken as "One who rules a country." Table 31 shows the growth in the meaning of the word as indicated by the increase with age of the number of pupils who could give the complete definition.

The sex differences shown within the last six age-groups are decidedly interesting, for girls have in general somewhat better language facilities than boys. In this particular instance it may be

TABLE 31: *Increases with Age in the Percentages of 1400 London School Children Giving an Acceptable Definition of the Word "Emperor" (Barnes)*

| AGE IN YEARS | % OF BOYS<br>GIVING COMPLETE<br>DEFINITION | % OF GIRLS<br>GIVING COMPLETE<br>DEFINITION |
|--------------|--------------------------------------------|---------------------------------------------|
| 8            | 3                                          | 3                                           |
| 9            | 21                                         | 11                                          |
| 10           | 34                                         | 22                                          |
| 11           | 58                                         | 42                                          |
| 12           | 60                                         | 48                                          |
| 13           | 62                                         | 50                                          |
| 14           | 74                                         | 65                                          |

that the higher percentages of the boys is evidence of their characteristically greater preoccupation with power and concepts relating to it. Within each sex group we see a regular progression, with age, toward greater command of the word's precise meaning.

*Growth of richness of meanings.* The growth of richness of the connotations of a word is shown in the type of definition given by children at various stages of development. Ask a typical five-year-old child, "What is an apple?" and the usual response will be: "You eat it" or "It is to eat." Ask an older child the same question, and the answer will characteristically be richer. Here is an example of an answer given by an average child of twelve: "An apple is a fruit which grows in a temperate climate. It is good to eat." Items of this sort have been used successfully to measure intellectual development and are frequently included in standardized tests of intelligence, since vocabulary tests have been found to be more reliable than any other single measure in indicating level of intelligence.

*Building a better vocabulary.* Although the growth of vocabulary is determined in part by hereditary capacities, it has been shown that children's vocabularies will increase more rapidly if they are given new experiences. For example, one little boy who was reared in the city showed a sudden increase in the size of his vocabulary as a result of spending a few months in the country, where he encountered many new and interesting things for which he just had to learn the names.

Throughout life one can improve one's precision of language and thought by making a conscious effort to do so. A larger, more precise vocabulary will help you in your thinking and make your writing and conversation more interesting to others. Here are some rules.

A. Give weary words a rest. Locate the overworked words in your vocabulary and give them a rest. Many words are overworked, because they are expected to do their own work and that of another word as well. Watch yourself as you talk and write, and ask yourself, "Do these words convey what I really mean?" Suppose you write or say: "It's funny how Smith broke his leg." Do you really mean that you were amused? Did Smith's misfortune cause you or anybody else to laugh or even smile? If not, the chances are that it was not funny. It might have been interesting; it might have been unusual; it might have been tragic; or it might have been alarming; but it probably was not funny. The list of weary words is long, including *beautiful, swell, grand, good, bad, glad, sorry, hate, mad, fix, say, thing, think, and pretty*.

B. Form the dictionary habit. We have already discussed the value of using the dictionary for looking up all new words (p. 353). Nothing else increases one's vocabulary so rapidly. Another purpose is served too, since by getting the exact meaning you are assured of using the word correctly.

Words are something like people in that both have life stories. The *Dictionary of American English* is the repository of these personal histories of words. It will be of great help in becoming better acquainted with the words you use. You will learn the reason for differences between the *English* and the *American* languages. Tell an Englishman that you have "*just bought a lot*" and he will probably counter, "*A lot of what, if I may ask?*" The American expression *lot* as meaning a plot of ground arose when the Pilgrims drew lots for the parcels of ground in the first American subdivision. There will be around 1,000,000 stories like this when the last ten volumes of this twenty-volume dictionary are published.

C. Practice the new words you learn. It is not enough to look up the new words that you meet if you are going to forget them immediately afterwards. Have you ever had the experience of

learning a new word which you had never heard before and immediately afterwards being astonished at how often you encounter it in reading and in the speech of others? A similar experience is possible with *using* words. Seek opportunities to practice the newly learned word, and you will amaze yourself to find how useful that word is. Overwork the new word for a time while you let the weary equivalent rest.

d. Read widely but well. There is no better way of building up a good working vocabulary as a means of better thinking than through wide reading. As you read authors who write well, you will learn many new words to be added to your own vocabulary.

*The use of graphic representation in language.* The learning of reading and writing is important in pedagogy, since it represents something new in the psychological development of language. Spoken language is essentially a matter of the vocal apparatus and the ear. The translation of language into the reading and writing of signs is an important piece of learning which most adults have accomplished. There is much to be said about the process of teaching children to read and write, but this interesting study must be reserved for specialized courses in educational psychology. The sound symbol and the visual symbol both get meaning through learning.

### *How Well We Think*

ABILITY TO THINK, like many other abilities, increases with age. Adult thinking, however, does not always attain the degree of clarity and skilfulness that it should. Often we are handicapped by hangovers from childish thinking. Too often, too, our emotional make-up is such as to hinder accuracy of thought.

#### *Problem solving at different ages*

Many psychologists have studied the ability of children and adults to solve problems. The following examples show how the accuracy and scope of problem solving increases with age and experience as children grow older and finally reach adulthood.

(1) *The average six-year-old can complete this sentence: "In the daytime it is light; at night it is \_\_\_\_."*<sup>17</sup>

(2) *The average ten-year-old can pass this one:* "There are four roads here: I have come from the south and want to go to Melton. The road at the right leads somewhere else. Straight ahead it leads only to the farm. In which direction is Melton: North, south, east, or west?"<sup>18</sup>

(3) *The average fourteen-year-old can pass this one:* "John said: 'I heard my bedroom clock strike yesterday ten minutes before the first gun was fired. I did not count the strokes, but I am sure it struck more than once, and I think it struck an odd number!' John was out all the morning, and his clock stopped at five to five the same afternoon. When do you think the first gun was fired?"<sup>19</sup>

(4) *A superior adult can pass this one:* "A mother sent her boy to the river and told him to bring back exactly 7 pints of water. She gave him a 3-pint vessel and a 5-pint vessel. Show me how the boy can measure out exactly 7 pints of water, using nothing but these two vessels and not guessing at the amount. You should begin by filling the 5-pint vessel first."<sup>20</sup>

### *Childish talking and thinking*

The preceding examples illustrate the fairly obvious fact that children do not think so clearly as do adults. What are some of the characteristics of childish thinking?

Childish thought is egocentric. How we think is revealed by how we talk. Whereas adult talking is characteristically social, representing to a large extent an interaction between people, childish talking is essentially unsocial or *autistic*. Piaget has gathered a wealth of evidence bearing out this point,<sup>21</sup> some of it from a study of the spontaneous talking of children when with companions. At the *Maison des Petits* (school for young children) connected with the Rousseau Institute in Geneva, Switzerland, Piaget and his students made records of all the words spoken by groups of children engaged in unsupervised play. This procedure is laborious, but the results justify the effort. Young children at play talk to themselves a good share of the time; this early talking is spontaneous play which answers the child's own needs but does not consider the satisfying of other people.

In another phase of the work of Piaget and his followers, records were made of the attempts of children to solve problems and answer questions carefully designed to reveal their thought processes.<sup>22</sup> These two lines of evidence have gone far toward clarifying for us the early stages of the development of thinking in man.

Children's early thinking is as self-centered as their talking. The young child is quicker to grasp the relationship between a fact or object and himself than he is to see how objects relate to other objects or to other persons. Boys of seven and eight years were asked, "What does the moon do when you take a walk?" They usually replied that the moon followed them. The writer asked a little girl of four years the question, "Why does your father work?" Her reply, "To make money to buy me a scooter," conforms to the findings of Piaget. To the child the whole world is made to order.

*Children do not grasp steps in reasoning.* Children give no evidence of grasping the formal steps in reasoning. They cannot describe the steps in their process of thinking. This lack of conscious realization occurs whether the solution arrived at be right or wrong. Piaget asked a child to solve the following problem: "It takes fifty minutes to walk to a city, but the trip can be made five times faster by bicycle. How long will it take by bicycle?" The child's answer was forty-five minutes. When asked to explain how that answer was obtained, the child replied in a manner none too illuminating: "I tried. I found forty-five." Another boy giving the same answer said: "I took ten and ten, then ten and ten, and then I added five." The explanation obviously assumes knowledge of some answer—an incorrect one in this case—and cannot be regarded as giving a true description of the actual thought process in arriving at that answer.

Another example illustrates the lack of conscious realization in childish thinking. The following problem was presented: "This table is four meters long. This one is three times as long. How many meters long is it?" The child answered, "Twelve meters." Then the child was asked, "How do you know that?" "I added two and two and two and always two." "Why?" "So as to make twelve." "Why did you take two?" "So as not to take another number."

*Children confuse correlation and causation.* Children use one of two facts correlated in time as the explanation or cause of the other. Some examples will make this clear.

*Question:* "Why does your daddy go to the office?"

*Answer:* "He goes there every day."

*Question:* "Why does the sun not fall down?"

*Answer:* "Because it is hot."

or

*Answer:* "Because it is high up."

Children obviously are content with unanalyzed observations. They confuse correlation and causation. This inability to appreciate objective relationships is probably related to their egocentrism. Much disconnectedness of thinking is a further result. Piaget gave children sentences in which a certain statement was made followed by the word *because*, and the children were to complete the sentence. Those observed typically revealed a lack of any notion of causality. Often the relationship was completely inverted as in the following example:

*Given:* "A man fell down on the road because....."

*Filled in by the child:* ".....he broke his leg."

*Children lack experience.* We must not forget that children have not had time to gather in all the experience needed in careful thinking. Children very soon hit upon the method of questioning as a rapid means of getting much necessary information in the absence of first-hand observation. The questions are always suggested by something in the child's immediate life and surroundings, but they serve to broaden the child's conception of the world and of the people in it. Here is a list of questions asked by four-year-olds:

"Why doesn't the ink run out when you hold up a fountain pen?"

"Why does it get lighter outside when you put the light out?"

"Why don't we see two things with our two eyes?"<sup>23</sup>

It is the duty of parents to answer such childish questions in a way that the child can understand. To fail to do so stultifies the child's curiosity and denies him the joy of possessing an inquiring mind as an adult. No question is too silly from the child's point of view to deserve an answer. As the child grows older, he should be initiated into the numerous sources of knowledge. He should be taught to work out the answers for himself from observation or from reading. No home is complete without simple reference books and dictionaries for the child who can read.

Huang compared adult and childish thinking by having his



subjects explain conjurers' tricks, optical illusions, and instances in which a less familiar physical force acts in opposition to a better known one.<sup>24</sup> He concludes that children are as capable as adults of giving logical explanations when the factor of past experience is ruled out. Huang's subjects were the children of professional people living in a highly intellectual atmosphere. Thus the fact that his subjects succeeded more often in giving a true account of cause and effect might also be attributed to their better training in thinking as compared with the children studied by Piaget. He further concludes that many childish errors in thinking arise out of the child's lack of information rather than indicating a fundamentally egocentric tendency. Dennis and Russell, using Piaget's questions and method, confirmed Piaget's findings in a study of the thinking of Zúñi children.<sup>25</sup> The differences between the findings of Piaget and Dennis and Russell and those of Huang illustrate vividly the necessity of interpreting the results of a particular psychological experiment in terms of the cultural environment which surrounds the subject and in terms of the particular conditions of the experiment, especially when these vary from one experiment to another, as in the present case.

### *Cloudy thinking in adults*

Clear thinking is man's priceless gift; cloudy thinking is his curse. Superficially they are very much alike, especially introspectively, with the result that almost everyone regards himself as a clear thinker, whether such is the case or not. There are many kinds of cloudy thinking, springing from a multitude of factors in the human being and his environment. You can discover these types by engaging people in discussion and noting the arguments which they present. Better still, you can look at your own thinking with a cold and unprejudiced eye and note many of the errors common to your thought and that of others.

*The influence of prejudices and beliefs.* Abel employed one of Piaget's techniques for gaining insight into how people think, that of having one college student explain something to another.<sup>26</sup> In one of Abel's experiments a college student listened to the following passage in a paragraph of 186 words.

Ancient cities which have been buried in the sands of the desert are evidences of the domination of climate rather than of the destruction accomplished by man.

The student then attempted to explain it to another person as follows:

Because of the ravages of war rather than the effects of climate, ancient cities are buried in the sands of the desert.

In this example, the student did not comprehend the sentence as a whole. The text says nothing about war. Her past experiences, however, had convinced her of the ravages of war. In her version she reversed the importance of the two factors of climatic destruction and human destruction. This tendency to read our own beliefs and prejudices into everything we seek to understand is very common among unclear thinkers. In the next chapter we will see evidence of the effects of prejudices in our thinking about other people.

*The all-or-nothing nature of cloudy thinking.* A characteristic of cloudy thinking is that it is all or nothing. For example, "Willkie would have been the saviour of Democracy; Roosevelt is a dictator."

We cannot make the statement that "criminals are cowards," because certain acts of criminals require extraordinary bravery. Furthermore, the worst criminal is law-abiding most of the time, as Metfessel has pointed out.<sup>27</sup> Be somewhat distrustful of the all-or-nothing thinker; his emotions probably have swayed his logic.

*Influences from reading.* What we think is influenced to a considerable extent by what we read in books, magazines, and newspapers. Before we wholeheartedly adopt the facts and opinions we read and before we quote them, we should make an effort to determine their authoritativeness.

A. The authorship of books. Make certain that the author knows what he is talking about. Don't accept statements which are not backed by evidence.

Much popular writing is based on facts, but the author does not bore the reader with the details. In this case it is especially necessary to look up the standing of the author. The wildest enthusiasm or the bitterest antagonism is often found in the writer

who is poorly informed. If the author is not listed in a standard biographical dictionary, you can be certain that he is not well-known, although this does not mean that he is not an authority, for he may be too young, or he may be writing his first book of this type. If the subject is closely related to science, you will do well to look in *American Men of Science*. The men included in this work of reference are all of good reputation among their co-workers.

Make certain that your author is writing on some subject in the field in which his reputation has been earned. A physicist, for example, no matter how well-known he is in his own field, may or may not have sound ideas on religion, politics, or economics. Accept what the authority says about his own field even when he does not give the evidence, but when he is talking outside his own field, test him as you would any other amateur. Make him give the evidence before you accept his statements.

Each recognized profession has some official society which makes an attempt to guarantee the ability and honesty of its members. A good writer will usually be affiliated with one of these societies. Your reference librarian can help you look him up. If all other sources fail, you will do well to write to your nearest university for details concerning the standing of an author.

There is an unusually great proportion of pseudoscientists and quacks among the popular writers on psychological topics. Many of these popular authors are willing to say anything that will give the reader a thrill of interest. They are not in the least concerned with the truth of their statements or in the possible harm which the information they peddle might do the unsuspecting reader. For this reason it is particularly important that you investigate the standing of the popular psychologist. Each year the American Psychological Association prints a year-book containing the names of psychologists of good standing in the profession. If a man or woman is not listed in this book or is not working in collaboration with some person who is, there should be a real doubt in your mind as to the ability of that person. The American Association for Applied Psychology in its Directory of Applied Psychologists lists about 600 specialists and gives a description of their training and experience.

Oftentimes a popular writer who has no reputation in any special field of knowledge will write a book which will carry a foreword or preface written by some recognized expert. If this foreword states that the manuscript was read by the authority and accepted, you should base your appraisal on the reputation of the expert who accepts it. Authorities in the various professions are usually jealous of their reputations for truth and will not carelessly permit their names to be associated with that of a quack.

B. How to read the newspaper. "It's true, all right. I saw it in the newspaper." We have all heard this statement, and many of us have not yet outgrown such blind acceptance of newspaper authenticity. The accuracy of the newspaper account suffers from many possible sources of error. In the first place there is the factor of speed. Newspaper reporters work under great pressure at all times. They might prefer to stop to check details for accuracy, but they have to "make a deadline."

Then, too, there is the matter of protecting the interest of the advertiser. Newspaper subscriptions do not even pay for the paper stock. The modern newspaper depends on advertising to pay the bills and yield the profit. Consequently there are times when the editorial policy of the paper is influenced by the advertisers. This type of distortion is most likely to appear in connection with stories concerning strikes and labor trouble, unsanitary conditions in the manufacturing plants of advertisers, and in other instances in which the financial interest of the advertiser is at stake.

Many large companies hire writers to prepare news stories, editorials, and feature articles presenting their point of view to be sent to newspapers free of charge in hopes that some editor will use them. Once the overworked editor of a community paper seized one of these prepared articles from a stack two feet high and, glancing at the first few lines, sent it to the composing room. The linotype operator followed the copy faithfully. It was not his work to edit. The paper came out carrying a well-written and enthusiastically convincing editorial on the great service rendered by utility companies to the public. There was no mention of cases where public ownership of water, light, or transportation systems had resulted in savings to the members of the community.

As the reader continued down the column of masterful English prose, his sympathy for the cause of the utility companies mounted, only to suffer a rude drop upon reading a line which the editor should have marked out with his blue pencil: Released by the *Public Relations Department of the XYZ Light and Power Company*.

In reading a newspaper it is well to note how the same story is handled by papers of different bias. The truth about a strike in a large steel mill will probably lie somewhere between the account given by a labor paper and one owned by reactionary publishers.

In a recent study a group of Washington correspondents were asked to rate the large city newspapers on the basis of fairness and reliability in the handling of news. The dozen rated as most fair and reliable are as follows in order of choice: *New York Times*; *Baltimore Sun*; *Christian Science Monitor*; Scripps-Howard papers as a group; *St. Louis Post-Dispatch*; *Washington Star*; *New York Herald Tribune*; *Washington Post*; *Philadelphia Record*; *Kansas City Star*; *Newark Evening News*; *Des Moines Register*, and *Des Moines Tribune*. This order would change from time to time with shifts in editorial policies and loyalties.

There is much the reader can do for himself no matter what the bias of the paper he is reading. Ask yourself (and make the paper answer) the following question: "Who says so?" "Did you guess right last time?" If you check the statements and forecasts over a period of time, you may form a valuable opinion of the accuracy of the paper. Do a lot of background reading in first-class weekly and monthly magazines and reviews. There is a certain logic in the flow of the news. You can become sensitive to this logic and on your guard against obviously inaccurate reporting or obviously foolish predictions.

Pleasantness, and the desire to believe. As we have already seen, numerous studies by psychologists have shown that we tend to forget the unpleasant more than the pleasant. Charles Darwin was so well aware of this fact that he made a particular effort to find and record evidence which was negative to his theory of evolution. Do not trust your memory, especially with regard to facts or suggested solutions which are unpleasant. They are more slippery than the things that you prefer to believe.

Lund has studied the relationship between belief, desire to believe, and evidence for or against the truth of a series of propositions.<sup>28</sup> A set of thirty issues in various fields of human interest was drawn up and presented to a large number of subjects. The subjects were asked to indicate the degree of their belief or disbelief in terms of the following scale:

| <i>Degree of Belief</i>              | <i>Rating</i> |     |     |
|--------------------------------------|---------------|-----|-----|
| Belief allowing for no doubt         | 10,           | 9,  | 8   |
| Fairly strong belief                 | 7,            | 6,  | 5   |
| Slight belief—an element of doubt    | 4,            | 3,  | 2   |
| Absence of both belief and disbelief | 1,            | 0,  | -1  |
| Somewhat inclined toward disbelief   | -2,           | -3, | -4  |
| Fairly strong disbelief              | -5,           | -6, | -7  |
| Disbelief allowing for no doubt      | -8,           | -9, | -10 |

Some typical propositions follow:

Was Lincoln an honest and upright man?

Is a democracy the best form of government?

Does a black cat crossing your path cause bad luck?

Did the whale swallow Jonah?

Is Christianity losing its influence in this country?

Do two plus two equal four?

Will traffic in liquor ever be entirely abandoned?

After the ratings of the strength of belief or disbelief had been completed, the subjects rated the degree to which they desired the proposition to be true or not true according to the following similar scale:

| <i>Degree of Desire</i> | <i>Rating</i> |     |     |
|-------------------------|---------------|-----|-----|
| Highly desirable        | 10,           | 9,  | 8   |
| Quite desirable         | 7,            | 6,  | 5   |
| Somewhat desirable      | 4,            | 3,  | 2   |
| Indifferent             | 1,            | 0,  | -1  |
| Somewhat undesirable    | -2,           | -3, | -4  |
| Quite undesirable       | -5,           | -6, | -7  |
| Highly undesirable      | -8,           | -9, | -10 |

The results showed that actual belief and desire to believe run hand in hand regardless of the nature or the evidence. Clearly,

then, it should be easier to convince a person of something he wishes to believe than to talk him into accepting a proposition which he does not want to believe.

The desire of the public to believe is responsible for many get-rich-quick schemes. The "Ham and Eggs" amendment proposed a few years ago in California illustrates how far the will to believe can blind people in their attempts to evaluate a suggested solution to the important economic and social problem of security for the aged. Take care that you do not believe something (evidence as to its truth being lacking) simply because you want to believe it.

*Failure to consider all of the data.* A false conclusion may be consistent with part of the data but inconsistent with another part. As long as we neglect this other part of the data, the solution cannot be adequately checked. If we let theory-making precede the collection of data, we are particularly apt to be given to selection of cases which prove our point. We must let the data suggest the solution. To reverse this process, letting a theoretical solution suggest the data, is likely to end in error. Suppose that you have the theory that red-headed persons are hot-headed. You can always find instances of red-headed hot-heads, but you must be certain that the proportion of red-heads among hot-heads is greater than the proportion of red-heads among persons who are not hot-headed before you can draw the conclusion.

*Changes of methods of measurement will bring changes in results.* Frequency of crime is inferred from frequency of arrests. How a change of method of observation may result in error may well be made clear by means of an example. Crime statistics show that the number of arrests is greatest near the beginning of the year. This could mean that more crimes are committed during this period; on the other hand, it could mean that law enforcement is more strict at that time. Let us take another example. You have often heard that the rate of insanity is increasing during modern times. Is the true rate of insanity increasing, or is it merely that modern requirements for successful adjustment make the presence of insanity more of a handicap and hence more obvious than it used to be? We must be certain that the method of revealing the material in question has not changed before we can conclude that the fact itself has changed.



*Mistaking correlation for causation.* The fact that two things go together does not prove that one causes the other. There is, for example, a correlation between the number of frying pans in the kitchens of their homes and the grades that school children earn in spelling. Does this prove that frying pans cause spelling or that spelling causes frying pans? Neither is the correct answer. Both of these facts are due to some third set of causes which have not been mentioned and may not, in fact, be known.

*The use of technical terminology.* Do not let yourself be fooled by high-sounding "two dollar" words. Ideas are often as easily carried by simple, short, and clear words as by more complicated terms. For example, when three physicians agree that a musician suffered:

"traumatic tenosynovitis of the flexor  
digitorum sublimis and profundis muscles  
at the metacarpophalangeal joint,"

his public is content to know that the maestro had a sore hand.

There is nothing really wrong with words such as these if they do not lull you into the belief that you really understand them when you do not.

*Assuming things with the same name to be the same thing.* If we are not careful to distinguish between words and ideas, we will sometimes let the word overrule the idea. For example, the word *fatigue* is defined as a chemical condition in our tissues which is caused by working and which lowers our ability to work. Chemical activity occurs in tiring muscles which causes the muscle to work less efficiently as time passes. In the case of mental work, too, such as adding or memorizing, we find a lowering of efficiency after a period of work, but it appears long before any sufficient chemical change is noted. This also is called fatigue—"mental fatigue." The fatigue in these two cases is entirely different. In fact, the latter should not be called fatigue. It is really boredom. Nervous tissue does not fatigue. The fact that people speak of "brain fag" and think of it as a condition of depletion of nerve cells through overwork is a good example of the false concepts engendered by calling two different things by the same name. This is one of the most frequent types of error in loose thinking.

### *Checking our thinking and opinions*

Some thinkers go wrong because they accept the first solution that is suggested without going to the trouble of testing it against the known facts.

*Lay your opinions open to scrutiny.* A good way to protect yourself is to give your solution to some other person for criticism. If you cannot convince an intelligent, interested, and open-minded person that your solution is right, there is probably something wrong with it that deserves further thought.

*Syllogisms.* The method of formal logic has two important uses in thinking. Logic serves, in the first place, as a check on the accuracy of one's own thinking; in the second, to illustrate to another person trained in its use that a particular line of thinking is straight or crooked. Formal logic is not as often employed in the original thinking through of a problem as in evaluating the result.

One of the great advantages of a logical formula, such as the syllogism, is that it enables one to reduce an argument to an objective basis and thus circumvent prejudice.

In an experiment on the use of the syllogism Wilkins found that more than half of his subjects marked this syllogism as valid:<sup>29</sup>

All Mongolians have slant eyes.  
The Chinese have slant eyes.  
Therefore, the Chinese are Mongolians.

Notice that the conclusion is correct but that it does not follow from the two premises. When the syllogism was stated in terms of letter symbols which themselves carried no meaning of a specific sort, the subjects made just half as many errors. The practical application is obvious. Code your facts and then set them up as a syllogism to make the test. For example:

Mongolians = A.  
Slant eyes = B.  
Chinese = C.

Then set your problem up in terms of these symbols:

All A is B.  
C is B.  
Therefore, C is A.

The illogical nature of your conclusion thus becomes obvious immediately.

If, however, common sense tells us that a particular conclusion follows from two acceptable premises, we are quicker to recognize the validity of the meaningful syllogism than we are to recognize the truth of the equivalent relationships set in abstract symbols. Test yourself on the following two syllogisms. Are they true or false? How long does it take you to decide in each case? Of which decision are you the more confident?

All A's are B's.  
All C's are B's.  
Therefore, some A's are C's.

All men are human.  
All women are human.  
Therefore, some men are women.

Both of these syllogisms are invalid, but you recognize the invalidity of the second one much easier than you discover the falsity of the one stated in abstract terms.

*Graphic representation.* An even better method of checking our opinions is by means of graphic representation. Let us draw

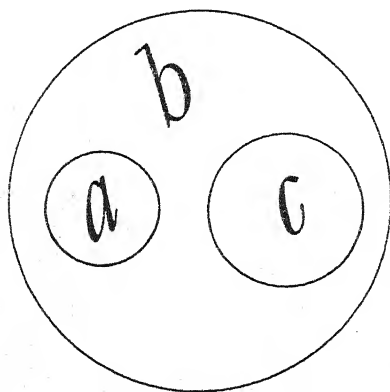


FIGURE 59. *Checking your opinions may be a matter of a, b, c.*

a diagram of the relationships in the Mongolian and slant-eye problem, using the letter symbols set up in the discussion of that example. (See Figure 59.)

The area within the large circle represents B, or *slant-eyed people*; the area in one of the smaller circles lying within the larger one represents A, or *Mongolians*. The relationship of the two circles shows that Mongolians are slant-eyed people. Circle C, representing *Chinese*, must also fall within the area B, which contains all slant-eyed people. Notice that the directions are complied with when this is done. A (Mongolians) might or might not coincide with C (Chinese) and still satisfy the conditions stated in the syllogism. Common sense, not the facts given in the syllogism, tells us that Chinese are Mongolians.



Thinking is behavior which uses symbols. There are two extremes in thinking: reasoning and autistic thinking. They are alike in using symbols, but they are different in their relationship to reality and the world of action.

The advantages of the thoughtful approach to a problem over sheer trial and error are that it saves time and materials and is safer. Thinking rarely proceeds in a straight line from problem to solution. We arrive at the solution by a process of approximation and correction.

Spoken words are responses of the vocal apparatus. Through a process of conditioning, these responses take the place of manipulation of objects spoken about. Spoken words affect other people as stimuli. The larger one's store of symbols, the greater the range of problems about which one can think.

Ability to think increases with age, but we are often handicapped in our adult thinking by vestiges of childish thinking and by our emotional make-up. There are many sources of fallacious thinking. To know about them is a great aid in avoiding them. Children are self-centered in their thinking and make errors by neglecting to consider factors outside themselves.

Some of the more frequently employed fallacies of cloudy thinkers are easily observed in their arguments. Errors creep into our thinking through the misuse of logical formulation. Diagrammatic representations are frequently more helpful than logical formulation in thinking about problems of practical importance. Many errors in everyday thinking are due to our failure to consider all

the data. We are particularly prone to leave out the data that do not fit our theories.

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Answer to problem given on page 379: Since the two diagonals of a square are the same and one of them is also the radius of the circle, it is one inch long.

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### *Recommended Readings*

BLANSHARD, B. *The Nature of Thought*. Macmillan, 1940.

This is an extremely technical and philosophical analysis of thought.

CHURCHMAN, C. W. *Elements of Logic and Formal Science*. Lipincott, 1940.

An introductory textbook of logic, with exercises and reading suggestions. There is a treatment of modern developments in logic.

DELAGUNA, G. A. *Speech: Its Function and Development*. Yale University Press, 1927.

This thorough explanation and analysis of the function of language requires maturity of interest but is well worth the effort required in reading it.

*Dictionary of American English on Historical Principles*. University of Chicago Press, 1936-37.

This twenty-volume work, counting the ten to come, makes many words more interesting than most people.

GRISWOLD, F. H. *Creative Power*. McKay, 1939.

An interesting study of inspiration, based on the self-observation of those who have attained fame in the creative arts.

HARDING, R. E. M. *Towards a Law of Creative Thought*. Kegan Paul, 1936.

The author gives many illustrations of the importance of "fringe" ideas in the progress of science and art.

HUXLEY, ALDOUS. *Words and Their Meaning*. Ward Ritchie Press, 1940.

A thoughtful study by a distinguished author on the power of words to mold men's thinking and direct their acting.

JEPSON, R. W. *Clear Thinking*. Longmans, Green, 1936.

This useful manual is well worth your time. Easy to read, it shows you that clear thinking is not too difficult once you know how.

PONSONBY, A. *Falsehood in Wartime*. Dutton, 1928.

An account of cloudy thinking in wartime deliberately induced by propagandists and spontaneously generated from human prejudice.

SMITH, S. S. *The Command of Words*. Crowell, 1935.

An expert commander of words tells you how to do it.

WASHBURN, M. F. *Movement and Mental Imagery*. Houghton Mifflin, 1916.

The author of this classic outlines the motor theory of the complex mental processes.

WEIL, R., JR. *The Art of Practical Thinking*. Simon and Schuster, 1940.

One of the youngest of America's leading business executives gives an informal but realistic discussion implemented by numerous examples from everyday business problems.

PART FOUR

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*Man among  
People*







"We are not all equal, nor can we be so." GOETHE

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CHAPTER 12

PERSONALITY AND  
INDIVIDUAL DIFFERENCES

*Looking at the pattern of personality, we find more precise terms than "that something" to describe it. . . . Personality, no more mysterious or baffling than any other aspect of human life and activity, is measurable.*

**M**EN ARE by nature unequal. We must, therefore, try to understand what the differences among men are and what can and cannot be done about them.

There are a great many obstacles to the understanding of personality, obstacles presented by a vast accumulation of semi-scientific, inspirational writings of "experts" and downright superstition and false belief in the writings of laymen, whether they be authors of "success" books or copywriters for cosmetics. The psychologist attempts to avoid these distractions by looking upon personality as something which is measurable and understandable and therefore a proper subject for scientific study. Having defined personality to his satisfaction, he proceeds to study what clusters

of traits go to make it up and how environmental and hereditary influences guide its development.

### *Ways of Looking at Personality*

**P**ERSONALITY can be defined in two ways. We can define it in terms of the effect that a person has on other people with whom he has contact, or we can define it as the total physical, intellectual, and emotional organization of the individual—his likes, dislikes, abilities, weaknesses, attitudes, and ambitions.

#### *Personality as the effect a person has upon others*

The word *personality* comes to us from two Latin words, *per*, meaning through, and *sonare*, to speak. These two words are combined to give *personare*, which literally means “to speak through.”<sup>1</sup> At one time the noun *persona* was used as the name for a mask worn by actors to which a sort of megaphone was attached and

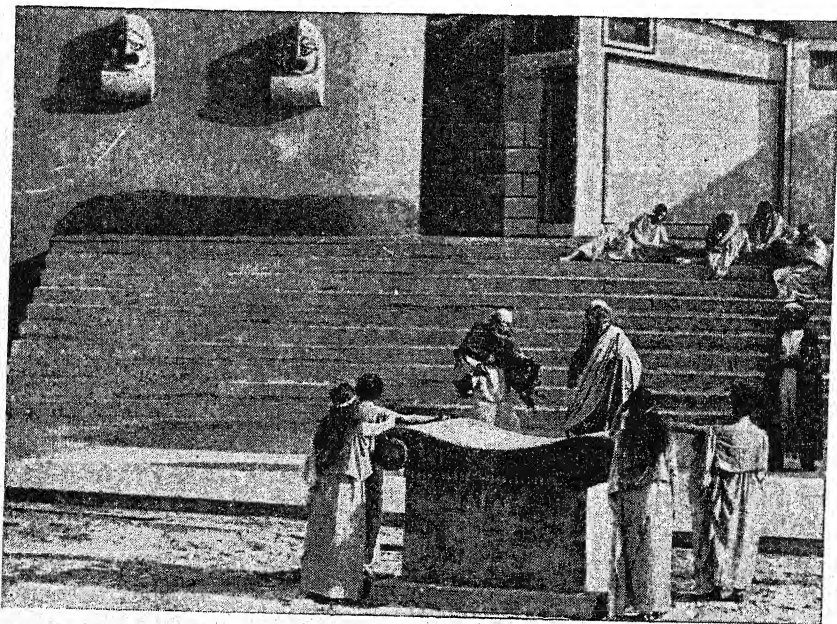


FIGURE 60. Although psychology is a relatively new science, many of its terms and concepts go back thousands of years. Personality, for example, is ultimately traced to the Greek theater and the use of masks in helping the actor create a certain effect.

through which the actor spoke the lines of his part. Later the word was used to indicate the part played by the actor, and from this the actors were called *personae dramatis*. The mask with its attached megaphone was thought of as something which increased the effectiveness of the actor, as something which revealed him to his audience in a distinctive way. Thus we find in the ancient history of our present-day English word a substantial basis for one modern definition of personality as the total impression which the individual makes upon the people around him. A fundamental description of our personalities, then, may be given in terms of the way we affect other people—personality as the “social stimulus value” of an individual.

### *Personality as the fundamental organization of the individual*

The second definition of personality goes beyond the superficialities of the party smile, the flashing eye of animation, and the firm handshake of the man with something to sell. Psychology is interested in the fundamental organization of the individual as laid down through heredity interacting with a complex physical and social world. In this approach to the description of human personality we shall be interested in the effects that a person has upon himself and the effects that others have upon him, as well as the effects he has upon others. These effects may be temporary or lasting. Such a definition of the human personality is far more fundamental and more personally and socially significant than the one given first. An understanding of personality in this sense points the way to increased personal and social efficiency. When we know why people develop as they do, we are in a better position to mold the course of an individual's development by supplying the proper cultural environment.

### *Measuring Personality*

TO FIND the basic patterns, or “types,” of personality, we must first measure each of its components, or traits. There are five basic methods of measuring personality: (1) tests; (2) rating scales; (3) interviews; (4) self-inventories; and (5) behavior sampling. Each type has its advantages and disadvantages.

### *Characteristics of good measuring instruments*

As soon as one starts working with measuring instruments, he comes up against two essential characteristics. To be of any value, a measuring instrument must possess both validity and reliability.

*Validity.* The validity of a measuring instrument is the extent to which it actually measures what we want it to measure. In measuring physical things we are rarely in doubt as to the validity of the measuring devices employed. No sane man would attempt to measure length with a thermometer, nor would he try to measure a man's height with a voltmeter, but because of invalid tests in the study of mental traits, we are sometimes guilty of errors almost as foolish as these. When using a test to select applicants for a mechanical job, for example, we must be sure that the highest scores on the test actually indicate the greatest mechanical ability.

Obviously there would be no point in giving them a spelling test: The best speller might or might not have any mechanical ability. Even a test concerned with mechanical materials could not be said to be valid until it had been demonstrated that the particular abilities called for in the test are the ones which will be needed in the job. This demonstration can be made only after certain applicants tested have been hired and have worked for a period of time. Then the good workers are separated from the bad ones, and a check is made to see which test questions the first group did well on that the second group did not. In Chapter 14 we will consider this procedure in greater detail.

Thus the true index of validity is the extent to which the instrument accomplishes the purpose for which it was intended. If we are trying to develop a test for use in selecting salesmen and if we find that those persons who get high scores on our test almost without exception succeed well in that occupation, we are satisfied that our test is valid, no matter whether the qualities measured are labeled "temperament," "social skill," or "business ability," or are simply left nameless.

*Reliability.* The reliability of a measuring instrument is the degree to which people having a particular score on it once would earn the same relative rank on it again at a later time. Reliability

is sometimes called *internal consistency*. Whereas validity is testing the qualities we really want tested, reliability is *continuing* to test them with the same results each time. If it is a matter of chance whether people do well or poorly on a test, their scores will not represent what they really know about the subject or what skill they really have, and we say the test is unreliable. A ruler would be unreliable if it were made of a material which expanded and contracted with slight changes in temperature.

One of the most common causes of unreliability in a psychological measurement or in a test of school achievement is the inclusion of items which must be scored on the basis of subjective judgment. If a test is to be reliable, the items must be set up in such a way that two or more persons can score it and get the same result.

Some instruments are low in validity because they do not have high enough reliability to measure anything at all. If a measuring device does not agree with itself, we can be absolutely sure that it is not measuring anything and that it cannot agree with any other criterion of excellence.

### *Psychological tests*

A psychological test is a carefully planned situation in which the individual's behavior can be characterized by a numerical value or score. For example, in a test of reasoning ability the subject is given certain problems to solve. His performance is scored as the amount of time required to solve the problems or as the number of problems solved in a given length of time.

Psychological tests may be classified in several different ways. First, we may group them according to *the aspect of the individual's behavior and experience they measure*. Thus we have tests of keenness of the senses, tests of school achievement, tests of vocational interests, tests of emotional stability, tests of general intelligence, character tests, tests of personality, tests of reasoning ability, word-association tests and so on.

Second, we label tests as *verbal* or *non-verbal*, depending on whether or not language is employed either in giving the directions or in "taking" the test.

Third, tests may be designated as *group* or *individual*, to show

whether an examiner can administer the test to several subjects at a time or must test them individually.

Fourth, many tests of ability to perform are classified as *speed* or as *power* tests. In a speed test the score is the amount of work done in a constant period of time, or the amount of time required to complete a constant amount of work; in a power test unlimited time is allowed, and the score expresses the degree of difficulty of the tasks in which the individual can succeed.

Fifth, tests may be further classified as *work-sample*, *analytic*, or *analogous*. Work-sample tests, as the term suggests, involve the measurement of a small period of performance of a particular task under standardized conditions. Five minutes of typing, scored for speed and accuracy, is a good example of the work-sample test. The *analytic* test measures any one of a number of specific and restricted abilities that enter into the performance of a complex task. (See Figure 61.) The use of such tests presupposes that the task in question can be broken down into a number of basic abilities. For example, a test for the selection of telephone switchboard operators might include specific tests of memory for numbers heard, speed of movement, and keenness of hearing. The use of analytic tests presupposes also that the component abilities are known. *Analogous* tests present the life situation in miniature. These tests simulate the real task without reproducing it.

This classification of tests is by no means hard and fast. A particular test as it is actually used will fall within several of these categories. It will be a group or individual test and also either a verbal or non-verbal test, and so on. Moreover, even finer distinctions between types of tests could be made, leading to still further classification. The terms introduced here are the ones which you are most likely to encounter as you advance in the study of psychology, and they should be included in your working vocabulary. You will see later in this chapter and in the next how some of the better known tests combine these qualities.

### *Rating scales*

There are certain traits or characteristics of the human being's mental make-up which cannot, as yet at least, be accurately measured by means of standardized tests. In fact, certain of our traits





FIGURE 61. *An analytical test—the speed with which the subject fits the geometric blocks into the proper recesses is a measure of his ability for certain mechanical tasks.*

or characteristics exist mainly in the minds of our associates. Obviously the easiest way to measure such personality traits as friendliness, generosity, or physical attractiveness is to ask a person's acquaintances what they think about him. The rating scale is simply a device for defining the trait under consideration and grading the individual on the basis of this trait.

The merit of a rating scale, like that of all instruments for measurement, depends on the degree of validity and reliability it possesses. Reliability of a rating scale is usually determined by finding out how well two sets of judges, using the scale, agree on the traits of the same individuals. The validity of a rating scale depends upon how well the judges understand the definition of the trait to be appraised, for the validity of a rating scale, as of any test, is the extent to which it does the task it was designed to accomplish.

There are at least five fundamental kinds of rating techniques. Each of these has its advantages and limitations.

*The method of paired comparisons.* In the method of paired comparisons the judge compares every individual with every other in the group of subjects to be rated and in each pair rates one as superior to the other in the trait under consideration. The subject who takes the largest number of "firsts" in the comparisons is the one who has the highest score. To make the comparisons in an orderly manner, the following type of chart is usually drawn up. The five subjects to be rated will be known as "A," "B," "C," "D," and "E."

|   | A | B | C | D | E | Total |
|---|---|---|---|---|---|-------|
| A |   | + | + | + | + | 4     |
| B | — |   | + | + | — | 2     |
| C | — | — |   | + | — | 1     |
| D | — | — | — |   | — | 0     |
| E | — | + | + | + |   | 3     |

The judge usually starts with individual "A" and asks himself, "Is 'A' more cheerful (or whatever the trait in question may be) than 'B'?" If the answer is yes, a plus mark is put in the row marked

"A" and in the column "B," and, correspondingly, a minus sign is entered at row B, column A. If the judge decides that "A" is less cheerful than "B," a minus sign is put in the space where the "A" row and the "B" column intersect, and the plus sign in the reverse position. Next the judge asks himself, "Is 'A' more cheerful than 'C'?" The answer is entered in the "C" column and, of course, in the "A" row. This procedure is continued until every subject has been compared with every other subject. When the table is completely filled in on the basis of the judge's decisions, all the pluses in each row are totaled up and entered in the column headed *Total*. These totals represent the scores of each of the subjects for the quality being rated.

Notice that in this method the subject is given a position *relative* to the others in his group, not an absolute score. Notice also that the number of judgments grows much more rapidly than the number of cases. In the sample just shown, with five cases, the total number of judgments required is 20. With six cases, 30 judgments would be required; with a hundred cases, 9900. Obviously the use of this test with large groups is impossible or impracticable.

*Order-of-merit method.* The order-of-merit method consists in lining up the subjects in a 1, 2, 3, etc., order by picking out the best and then the next best and so on until all the cases have been ranked for the trait under consideration. The objection to this method is the difficulty of considering the whole field and keeping each individual in mind until the best single one is picked out. This method, like the method of paired comparisons, gives relative positions and not absolute ratings.

*Absolute rating scales.* In absolute rating scales the judge assigns an absolute value to the trait being rated. With scales of this sort only one judgment is made for each case involved. Consequently this method is much speedier than the two preceding ones. It is subject to error in that the standards of the judge might fluctuate during the series and also because there is a "personal equation" for each different judge. Some judges assign too many high marks; others give too many low ones.

Below is an absolute rating scale which has been used successfully in a large university to determine the causes of student failures.

## PERSONALITY RATING SHEET FOR FRESHMEN

Name of student.....Date.....

Aiding individual students is based on scholastic records of achievement, health, and other factual records. Personality, difficult to evaluate, is of great importance. You will greatly assist the student named if you will rate him with respect to each question by placing a check mark on the appropriate horizontal line *at any position* which represents your evaluation of the student. It is not necessary to locate it at any of the division points or above a descriptive phrase.

Your rating will be considered confidential and suggestive only. You need not sign your name to this sheet unless you wish to do so. Fill in as completely as possible.

*No  
oppor-  
tunity  
to ob-  
serve*

1. *Scholastic Zeal*

|                                                   |                        |                             |          |                              |                                  |
|---------------------------------------------------|------------------------|-----------------------------|----------|------------------------------|----------------------------------|
| Does he display<br>enthusiasm for<br>school work? | Unre-<br>spon-<br>sive | Usually<br>indif-<br>ferent | Studious | An en-<br>ergetic<br>student | Craves<br>schol-<br>arly<br>work |
|---------------------------------------------------|------------------------|-----------------------------|----------|------------------------------|----------------------------------|

2. *Intellectual  
Ability and  
Aptitude*

|                                                                                                              |                 |                   |                          |                     |                   |
|--------------------------------------------------------------------------------------------------------------|-----------------|-------------------|--------------------------|---------------------|-------------------|
| Does he have<br>the ability to<br>assimilate<br>knowledge and<br>easily to adjust<br>to new situa-<br>tions? | A dull<br>pupil | A slow<br>learner | An<br>average<br>student | An alert<br>student | A keen<br>student |
|--------------------------------------------------------------------------------------------------------------|-----------------|-------------------|--------------------------|---------------------|-------------------|

3. *Initiative*

|                                                    |                                       |                                           |                                   |                                                                |                                                                 |
|----------------------------------------------------|---------------------------------------|-------------------------------------------|-----------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------|
| Is he a<br>resourceful<br>and original<br>thinker? | Needs<br>constant<br>super-<br>vision | Needs<br>occa-<br>sional<br>prod-<br>ding | Pre-<br>pares<br>assign-<br>ments | Com-<br>pletes<br>sug-<br>gested<br>supple-<br>mentary<br>work | Seeks<br>and<br>sets for<br>himself<br>addi-<br>tional<br>tasks |
|----------------------------------------------------|---------------------------------------|-------------------------------------------|-----------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------|

4. *Integrity*

|               |                      |                                              |                       |
|---------------|----------------------|----------------------------------------------|-----------------------|
| Is he honest? | Positively dishonest | Tries to be, but fails sometimes; unreliable | Unquestionably honest |
|---------------|----------------------|----------------------------------------------|-----------------------|

5. *Leadership Ability*

|                                                 |                       |                            |                    |                     |
|-------------------------------------------------|-----------------------|----------------------------|--------------------|---------------------|
| Does he have the ability to secure a following? | Definitely a follower | Tries but fails frequently | Usually successful | An inspiring leader |
|-------------------------------------------------|-----------------------|----------------------------|--------------------|---------------------|

6. *Social Attitude*

|                                   |             |               |                          |                               |                     |
|-----------------------------------|-------------|---------------|--------------------------|-------------------------------|---------------------|
| Is he group conscious?            | Anti-social | Self-centered | Has no positive attitude | Usually considerate of others | Strongly altruistic |
| Does he have a spirit of service? |             |               |                          |                               |                     |

7. *Emotional Control*

|                                   |                                                       |                            |                       |               |                             |
|-----------------------------------|-------------------------------------------------------|----------------------------|-----------------------|---------------|-----------------------------|
| How does he control his emotions? | Too easily moved to anger or fits of depression, etc. | Tends to be over emotional | Usually well balanced | Well balanced | Exceptionally well balanced |
|                                   | Unresponsive; apathetic                               | Tends to be unresponsive   |                       |               |                             |

Is the foregoing an individual or a composite rating (by more than one instructor)? .....

If an individual rating, how well do you know this student?

.....

Name and number of course .....

Man-to-man method. In the man-to-man method the judge is asked to equate the rated person to some known person who serves

as a standard. The standard men are selected by pooling the opinions of a large number of judges. Once the scale has been constructed, it is very easy to use. The judge is given a piece of paper on which the following information is printed:

| STANDARDS FOR NEATNESS |                         | Points |
|------------------------|-------------------------|--------|
| Highest:               | Captain Brown.....      | 15     |
| High:                  | Lieutenant Gray.....    | 12     |
| Middle:                | Lieutenant Spencer..... | 9      |
| Low:                   | Captain Smythe.....     | 6      |
| Lowest:                | Lieutenant Jensen.....  | 3      |

The judge takes the first name on the list of the men to be rated, decides which of the standard men he is nearest to in neatness, and assigns the proper number of points. Then the next name on the list is rated in similar fashion until the whole group has been assigned a numerical neatness rating. The greatest disadvantage of this method is that it can be employed only in situations in which the standard persons are well known to all judges. This is a real limitation in business and other organizations where the personnel changes from time to time. The outstanding advantage of the method is that the use of known human standards makes for clearer definition of the levels of quality. Many rating scales fail because the judge is not certain of the boundaries of the various classes into which he casts the persons being rated by him.

*The check-list method.* In the check-list method the judge is given a list of traits and is asked to check those which apply to a particular individual. A check-list might contain such adjectives as brutal, lazy, optimistic, likable, cowardly, stingy, and brave.

*Summary of rating scale methods.* The type of problem and the facilities at hand will determine which of the five rating scale methods can best be employed on any given occasion. Each, as we have seen, has certain advantages and disadvantages not shared by the others, which recommend it for use in some cases and not in others. None of them, however, can be expected to yield results as precise or reliable as a good standardized test. They should be used only where no adequate tests are available.

### *The interview as a means of diagnosing personality*

The personal interview is routinely used by employers for selecting new workers and by clinical psychologists and psychiatrists in their attempts to study personality disorders and to suggest cures. In the latter case the investigatory and the curative phases of the interviewer's work usually run side by side.

*The two forms of the interview.* Interviews may be standardized or informal. In the highly standardized interview predetermined questions are asked in a certain set order. This type of interview is probably but little better than having the literate subject write his answers directly on the interview form without the intermediary action of the interviewer. At the other extreme the interview can be so informal that it appears to be a casual conversation. Each of these methods has its advantages and limitations, its uses and abuses.

A. The standardized interview. The standardized interview is to be employed when the interviewers have little training and cannot be relied upon to avoid the common sources of inaccuracy and error in the interview. The disadvantage of the completely standardized interview is that it has the same artificiality that the printed questionnaire possesses. With this type of approach the interviewee is not very likely to "open up" to the interviewer. Simple routine facts of behavior can, however, be obtained in this manner. Another disadvantage of the standardized interview is that the procedure cannot be varied to meet individual cases. The interviewer must adhere to his plan and get as much of the standard information as he can. An outstanding advantage of this form of interview is that no time is wasted. Every word counts. There is little likelihood of the interviewer's being sidetracked and failing to cover all the significant points.

B. The informal interview. The informal interview takes the form of a conversation. While the interviewer and the person interviewed talk about this and that, the interviewer is alert to steer the conversation into the desired channels. As the various bits of information are supplied, they are jotted down, but in an unostentatious fashion since the very act of writing down what the interviewee says makes the conversation artificial and stilted.



The experienced interviewer is sometimes able to defer his note-taking until after the interview. Although expensive, the practice of taking the conversation down on a dictaphone concealed from the interviewee is an excellent way of combating the self-consciousness caused by the paper and pencil. Some of the advantages of the standardized interview can be retained without incurring any of the disadvantages if the interviewer prepares a formal list of the points to be covered and checks off each item as it is supplied by the interviewee. Obviously, ability to use shorthand is a great asset to an interviewer.

Setting the situation for the interview. The interview will be much more successful if a few preliminary preparations are made.

① The interview must have a purpose. If the personal interview is sought by the subject, the interviewee is naturally aware of its purpose; but if it is sought by the interviewer, the interviewee is entitled to an honest explanation of its purpose. Honesty and courtesy are expected from the interviewee, and that courtesy should be returned. Otherwise he is likely to be deliberately flippant or untruthful in his answers.

② Be prepared for the interview. Define your objective; know in advance exactly what you want to find out and obtain as much information as you can beforehand.

③ Privacy and freedom from interruption must be assured. It frequently happens that personal interviews become so personal that the interviewee breaks into tears, becomes angry, or otherwise expresses emotion. Such emotional outbursts are sometimes deliberately provoked by the interviewer by mental prodding to find a sore spot. The subject who feels that others are listening, or that the telephone will ring, or that somebody will knock at the door is far less likely to become confidential than he would were such eventualities obviously out of the question.

④ Sufficient time must be allowed at one sitting. The interview relating to a personality defect or difficulty usually starts slowly. Once started, however, the subject frequently decides to Tell All. It is highly desirable to let him continue until he is ready to stop. To shut him off so that another appointment may be kept might mean that the doors will be closed the next time the interviewer tries to explore these inner feelings.

*Conducting the interview.* The art of the interviewer can be acquired only through patient practice. But some suggestions can be made of precautions to be observed in acquiring the art.

Use simple language. This is especially important when working with laboring people and foreigners. It is easy for the college-trained person to forget how far he is above the majority of people in facility with language.

Ask one question at a time. Wait for one question to be answered before going on to the next. Do not interrupt. Let the other man talk. It is his impressions that you are interested in. Let him get off the subject for awhile if he chooses. This puts him at ease and paves the way for continued friendly relations throughout the interview. There is a limit, of course, but enforce it with tact.

In phrasing your question be careful not to suggest the answer. This is very important. In a purely fact-finding interview the interviewer must not imply to the interviewee which answers please him and which displease. Assume the poker face.

Record all data immediately, including both the interviewee's answers and your observations of his behavior. How people act tells us more sometimes than what they say. The human memory is not to be trusted when accurate records can be taken. You must put down the facts as you get them. To try to think back is to invite error. Label guesses as such. Be certain that your guess at the moment will not be later taken for a fact. Distinguish between what you see and what you think.

In concluding the interview, leave the way open for possible future meetings. Perhaps a follow-up will be required. Leave the interviewee in a pleasant frame of mind.

*How reliable is the interview?* The reliability of the interview will depend upon who is doing the interviewing, what he is trying to find out, the degree of standardization, how much time he can spend, etc. Scott studied the ability of six experienced sales managers to interview prospective salesmen.<sup>2</sup> Thirty-six applicants were interviewed by each of the six sales managers by any method that they cared to use. Presumably they used the methods they felt to be the best. Table 32 shows the ranks assigned by each of the interviewers to sixteen of the candidates taken at random.

TABLE 32: *Ranks Assigned to Sixteen out of Thirty-Six Applicants by Six Sales Managers*

| APPLICANT | RANK ASSIGNED BY SALES MANAGER:* |          |          |          |          |          |
|-----------|----------------------------------|----------|----------|----------|----------|----------|
|           | <i>A</i>                         | <i>B</i> | <i>C</i> | <i>D</i> | <i>E</i> | <i>F</i> |
| I         | 5                                | 11       | 2        | 1.5      | 3        | 2        |
| II        | 8.5                              | 11       | 13       | 3        | 7.5      | 5.5      |
| III       | 6.5                              | 18.5     | 25       | 21       | 15       | 22       |
| IV        | 2                                | 2        | 1        | 1.5      | 1        | 5.5      |
| V         | 15                               | 3        | 4        | 28       | 3        | 14.5     |
| VI        | 1                                | 11       | 5        | 9        | 15       | 3        |
| VII       | 17.5                             | 18.5     | 19       | 12       | 23       | 26       |
| VIII      | 14                               | 18.5     | 27       | 16       | 15       | 23       |
| IX        | 28                               | 11       | 22       | 11       | 3        | 9        |
| X         | 18                               | 11       | 16       | 18       | 15       | 10.5     |
| XI        | 12                               | 30       | 22       | 35       | 30       | 14.5     |
| XII       | 3                                | 23       | 12       | 5        | 15       | 19       |
| XIII      | 4                                | 11       | 6        | 24       | 23       | 18       |
| XIV       | 3 <sup>1</sup>                   | 5        | 8        | 4        | 7.5      | 2.5      |
| XV        | 6.5                              | 1        | 7        | 7        | 7.5      | 7        |
| XVI       | 28                               | 30       | 3        | 29       | 23       | 8        |

\*When two or more applicants are tied in the ranking of one manager, their ranks are averaged and this average figure assigned to each, just as in a track meet. For example, Manager *D* saw no difference between Applicants I and IV. Together they account for ranks 1 and 2. Hence each gets 1.5. Applicant II was the third person in line and hence got a rank of 3.

Notice that Applicant XVI received a rating of 30 from Manager *B*, but that Manager *C* gave him a ranking of 3. Results of experiments of this sort would seem to indicate that getting the job depends almost as much on who interviews you as it does upon what you have to offer. Although the chance for errors is enormous with some interviewers, even the poorest interview will give results better than chance. Since this is true, any desired degree of reliability can be achieved by increasing the number of interviewers—that is, of course, if the applicant is not worn out by being so frequently interviewed.

The effects of prejudice upon the results of a personal interview are brought out in the following example:

Rice analyzed the interview records of twelve social workers who had interviewed a total of 2000 homeless men applying for free lodging.<sup>3</sup> Although the interview was scheduled and standardized, the interviewers had unconsciously influenced the applicants to give desired answers. One of the interviewers was an ardent

prohibitionist. He found that the downfall of 62 per cent of the applicants was due to the excessive use of alcoholic drink, while but 7 per cent of the cases of social failure were to be attributed to industrial conditions. Another interviewer, a Socialist, found that a mere 22 per cent of the unfortunate men owed their plight to the demon rum, whereas 39 per cent had been reduced to destitution by unfortunate industrial and economic conditions. It is even more interesting to note that the prohibitionist, although giving the figures cited above as correct for "actual" cause, admitted that only 34 per cent of the *applicants themselves* mentioned liquor as the cause while 42.5 per cent attributed their condition to industrial conditions; whereas the Socialist reported that 11 per cent blamed alcohol and that 60 per cent named industrial conditions as the reason. Since the groups of men observed by the two workers were comparable, it is obvious that one or both of the interviewers were not only giving distorted interpretations of the items as noted on the interview blanks but were actually suggesting the desired answers to the men interviewed. This does not imply that the interviewers were deliberately attempting to build up propaganda for prohibition or against capitalism but merely illustrates the influence of prejudice in affecting observations.

Harvey studied the effects of adverse bias on ratings made on the basis of personal interviews of three traits—reliability, sociability, and emotional stability.<sup>4</sup> The bias was produced by giving the interviewer, before the interview, a character sketch of such a kind as to suggest that the candidate was inferior in one of these traits. It was found that the bias did (without awareness of the interviewer) affect judgment in only 40% of the cases in which it was applied. But when true character sketches were given, there was agreement with these in about 60% of the cases. This difference suggests that there is a limit to the operation of a bias. You can influence a judge toward "rightness" more easily than toward error.

In the proper hands and carefully worked out, the interview can be a very workable means of diagnosing human material. Hovland and Wonderlic have developed a standardized interview which works extremely well in picking out successful employees for a large company.<sup>5</sup>

*Precautions must be taken in judging personality in others*

In both rating scales and interviews, and to a lesser extent in tests too, we have a variable which can cause considerable error unless we take every precaution to avoid it. Measurements which we make of another human being are always apt to be colored by our own feelings and attitudes. Physical characteristics like distance and temperature we can measure accurately and objectively with precision instruments. Where we are ourselves the measuring stick, such an accurate, objective measurement is seldom obtained. We have just seen one example of this in Rice's study. Others follow.

*The "halo-effect."* How we see a detail in a complex situation is greatly influenced by how we see the total situation. One of the great weaknesses of the rating technique is our human inability completely to isolate the trait to be rated from the influence of other knowledge we have about the individual. Thorndike has given this type of error a special name—"halo-effect." For example, people who are likable or who are respected, say for their intelligence, will be rated as better than they really are in other desirable traits.

Let us examine a case in which error in observing human nature results from failure to isolate the trait to be observed.<sup>6</sup> During the World War a certain captain was rated as to intelligence by many of his associates as "the poorest man I ever knew." Yet this very officer stood first on three different intelligence tests given to 151 officers. He had been a Rhodes Scholar and had made an excellent record at Oxford. Comments of eight of the thirteen officers who placed this man at the very bottom of the scale described him as "impossible to live with," "a rotter," "yellow," "conceited," "a knocker," etc. It seems quite clear that these officers were unable to isolate such a quality as intelligence from the other and objectionable personality traits—that they did not allow for halo-effect. The psychologist knows that this halo-effect exists and guards against it.

The best way to guard against the halo-effect is to judge but one trait at a time. If a judge tries to rate more than one trait at a sitting, his earlier ratings of an individual are bound to influence

his later ones. Even rating one trait at a time, however, is not an absolute guarantee that the halo-effect has been avoided. If, for example, a teacher remembers George as attentive in class and well behaved on the playground, she is almost certain to rate him above his true position in intelligence even though she has not been asked to rate him on attentiveness in class or upon conduct at play. If the knowledge is there, it will very likely produce a halo-effect.

A prejudice, such as we saw in the interviews of the social workers (p. 437), is just as effective as actual knowledge in producing a halo-effect in rating human personality.

*Stereotypes.* Closely related to prejudices and other causes of halo-effects as sources of error in our estimates of human beings are the effects of "stereotypes," or preconceived notions as to how people of a given race or occupational or social group ought to appear or behave. For example, the artist is popularly believed to have long slender fingers on his "sensitive" hands, while the aggressive business man is popularly supposed to possess large or pudgy hands. Many of these popular ideas are misconceptions based on little or no evidence; they can, nevertheless, serve to influence our observations of people's behavior or appearance.

This tendency to classify people according to preconceived notions or stereotypes is strikingly illustrated by a series of experiments conducted by Rice.<sup>7</sup> College students and members of the Norwich Vermont Grange were asked to look at portraits of nine persons published in the Boston *Herald* for December 15, 1924. The individuals pictured and their positions at the time were: Edouard Herriot, Premier of France; James Duncan, Vice-president of the American Federation of Labor; Leonid Krassin, first Ambassador of the Soviet Government at Paris; Joseph W. McIntosh, Deputy Comptroller of the Currency; Martin H. Glynn, Governor of New York; Max Agel, arrested as a bootlegger; Charles M. Schwab, Chairman of the United States Steel Corporation; Howard Heinz, manufacturer of food products; and Senator George Wharton Pepper of Pennsylvania.

The pictures were pasted on a sheet of paper and numbered from 1 to 9 with no further information or means of identification. The subjects were then shown this sheet and told that it contained

the pictures of an alleged bootlegger, a European premier, a labor leader, a Bolshevik, a United States Senator, an editor-politician, two manufacturers, and a financier. They were asked to identify these individuals by number. The following table shows the amount of error which crept into the judgments of the college students. It should be borne in mind that certain of these pictures must have been rather familiar to the students, as many of the men shown were frequently featured in the daily news. In spite of this, numerous evidences of stereotypes are to be found.

TABLE 33: *Performance of 141 Students in Assigning Nine Given Occupations to Nine Photographs*

| PERSON PICTURED           | NO. IDENTIFYING PERSON AS: |              |           |           |                   |            |              |         |       | IDENTIFICATIONS WHICH WOULD BE CORRECT IF ONE GUESSED |
|---------------------------|----------------------------|--------------|-----------|-----------|-------------------|------------|--------------|---------|-------|-------------------------------------------------------|
|                           | PREMIER                    | LABOR LEADER | BOLSHEVIK | FINANCIER | EDITOR-POLITICIAN | BOOTLEGGER | MANUFACTURER | SENATOR | TOTAL |                                                       |
| Premier Herriot           | 54                         | 11           | 55        | 2         | 3                 | 4          | 4            | ..      | 133   | 15                                                    |
| Labor Leader Duncan       | 29                         | 25           | 15        | 13        | 14                | 1          | 30           | 9       | 136   | 15                                                    |
| Soviet Envoy Krassin      | 31                         | ..           | 9         | 15        | 11                | ..         | 16           | 59      | 141   | 16                                                    |
| Financier McIntosh        | 7                          | 20           | 14        | 15        | 16                | 24         | 33           | 8       | 137   | 15                                                    |
| Editor-Governor Glynn     | 6                          | 20           | 5         | 21        | 31                | 2          | 33           | 14      | 132   | 15                                                    |
| Bootlegger (alleged) Agel | 1                          | 6            | 9         | 4         | 11                | 86         | 18           | 2       | 137   | 15                                                    |
| Manufacturer Schwab       | 1                          | 14           | 4         | 18        | 20                | 2          | 56           | 21      | 136   | 15                                                    |
| Manufacturer Heinz        | 5                          | 19           | 6         | 31        | 16                | 6          | 46           | 10      | 139   | 15                                                    |
| Senator Pepper            | ..                         | 22           | 15        | 16        | 19                | 11         | 35           | 15      | 133   | 15                                                    |

Senator Pepper received the designation of labor leader, Bolshevik, financier, editor-politician, and manufacturer as often as, or more often than, that of senator. He obviously did not fit the senatorial stereotype. The correct identifications of Soviet Envoy Krassin were far fewer than the incorrect. He was shown in a wing collar, wearing a Vandyke beard and mustache, all of which gave him a "distinguished" appearance. The popular stereotype of a Bolshevik pictures a wild-eyed and dirty brute holding a red flag in one hand and a sputtering bomb in the other. The largest number of correct identifications was found in the case of the



alleged bootlegger. Mr. Agel was shown in a heavy overcoat with upturned collar, a cap, shell-rimmed glasses, and a cigar gripped firmly between his teeth. This corresponds rather closely to the stereotype of the bootlegger.

"He is certainly the criminal type." How often have you heard your friends make this or an equivalent remark? The notion that there are certain physical characteristics which go to make up a criminal type is widespread. This stereotype is so firmly implanted that it sometimes leads juries to find innocent men guilty or to neglect the evidence as presented at the trial. A governor of one of our states, a thoroughgoing believer in phrenology, once pardoned a convicted murderer who "looked honest" while his no more guilty accomplice was executed.<sup>8</sup>

*One's ability to judge human nature can be improved.* Fortunately through training we can overcome some of our stereotypes and susceptibility to the "halo-effect." A striking example of how we can increase the accuracy of our observations of human behavior through practice is found in an experiment conducted by Dr. L. J. O'Rourke, Director of Personnel Research for the United States Civil Service Commission.<sup>9</sup> A class of thirty beginners was being trained for the work of interviewing applicants. The interviewers-in-training witnessed examinations conducted orally by a trained examiner. At the end of each examination of an applicant the student-interviewers were required to assign one of four possible ratings to the applicant interviewed. On the very first day of the experiment and before any instruction whatever had been given, the thirty students showed large variations in the ratings assigned to each of the applicants. At the end of two weeks of training, however, the degree of agreement among the class had increased enormously. We must conclude that training had improved the ability of the subjects to observe. The interviewer, like the scientist, must strive constantly to increase the accuracy of his observations through intensive study and practice.

*Two heads are better than one.* The familiar saying that two heads are better than one holds true in measuring human personality by means of rating scales or personal interviews. The more judges there are, the more dependable will be their pooled opin-

ions. Increasing the number of judges or interviewers will not, of course, completely eliminate the halo-effect, for some persons will be likable to all judges or raters. Many prejudices, however, are matters of personal whim, and those of one judge may be balanced out by those of another judge.

The great difficulty in measuring personality in terms of the pooled opinions of many judges and raters is that we frequently wish to measure people who are unknown to a sufficiently large number of judges or raters. Then, too, such ratings require a great deal of time and arrangement.

It frequently happens that the individual carefully conceals some traits. Such traits cannot be adequately rated or judged, even in an interview, except by specially trained clinical psychologists or psychiatrists. Those very traits which we conceal behind the mask are often of extreme importance in determining the quality of a person's adjustments to life.

### *The self-inventory as a means of measuring personality*

To obviate the disadvantages of rating scales and interviews, psychologists have developed standardized self-rating scales or personal inventories. The personal inventories differ from the measuring instruments which we have discussed in that they require the person to give the needed information about himself by himself. In the self-inventory the subject is asked to answer questions concerning his inner experience and personal life; he is asked to tell what he likes and dislikes, to indicate his admiration or contempt for various persons in public life, to explain what he does and what he does not do. Several examples of the type of questions asked in self-inventories appear on the next page.

A self-inventory has meaning only when it has been checked or validated against some outside measure of the trait it is supposed to appraise. We can never be certain by merely looking at a series of items or questions what their significance really is. You might guess, for example, that newspaper editors like playing poker and dislike playing tennis; but could you decide on the basis of common sense that life insurance salesmen dislike museums and like educational movies? These are typical reactions, based on responses of men in these professions to a self-inventory blank.

The first self-inventory was constructed by Woodworth, who was chairman of the Committee on Emotional Fitness appointed by the National Research Council during the World War.<sup>10</sup> Obviously, one of the greatest problems in selecting soldiers and officers for training is that of getting emotionally stable men who will not break down under the emotional hazards of war. Taking an active part as officer or soldier in war requires a readjustment of emotional habits and moral values which is probably unequaled in any other experience. The rapid mustering of a capable army demands that the emotionally unsuited be discovered and thrust aside with as great accuracy and dispatch as are the physically inferior.

Woodworth's Personal Data Sheet was devised to show up the bad risks before their training started. Participation of the United States in the World War was an emergency affair and did not give much time for the sort of pre-testing and validation to which psychological tests are ordinarily subjected. Psychologists who offered their services to their country had to do an emergency job as well as they could, using all the knowledge of emotional abnormalities and weaknesses that was then available. Valid items were selected by searching the literature on abnormal psychology and psychiatry to gather as many questions as could be found which would reveal symptoms of the sorts of defective emotional organization likely to predispose a soldier toward a nervous breakdown when placed in action.

Some typical items from a self-inventory of emotional stability follow. You should remember in reading through these questions that one sign of emotional instability does not mean that you are below par in emotional health. Anyone has certain defective emotional adjustments. The ideal of a perfectly adjusted person has never yet been attained. The word *yes* or *no* in the parentheses following a question indicates the answer that is characteristic of unwholesome emotional organization.

Do you usually feel well and strong? (no)

Do you often feel that people are laughing at you? (yes)

Can you stand the sight of blood? (no)

Do you have bad dreams at night? (yes)

Have you ever walked in your sleep? (yes)

As a child did you sometimes feel that your parents were really not your own? (yes)

Do most people like you? (no)

Do you blush frequently? (yes)

Have you ever had a vision? (yes)

The great value of a long series of questions of the sort given above is that they enable one to compare oneself with the standards derived from large groups of people. Certain individuals feel that they are emotionally abnormal when in reality they are fairly sound. In such a case it is comforting to know how one really stands. There is also the added advantage that a list of questions of this sort when honestly answered can be studied by a trained psychologist to determine the source of emotional or personality difficulty in the interest of helping the individual toward a better adjustment.

The self-inventory is convenient because it does not require the assembling of a group of raters or interviewers. It is especially valuable in that it gets below the surface to tap the individual's own personal experience and feelings. It is defective in that the subject can, if he wishes, lie about himself. However, lying is not quite so easy as it would seem, because the average person does not always know which answers are significant of emotional trouble. The self-inventory has a further disadvantage in that a person does not altogether understand himself and hence cannot always give an accurate report. Despite these disadvantages, the self-inventory is a useful instrument in dealing with personality.

### *The method of behavior sampling*

The method of behavior sampling does not depend upon what a person says about himself or on what others say about him. It is fundamentally more apt to be valid than any of the measuring instruments so far discussed, in that it deals with actual behavior. The subject's typical behavior in a familiar situation is carefully observed. The essential difference between this method and the psychological tests discussed on pages 425 and 426 is that in behavior sampling the subjects do not realize that their behavior is being observed and evaluated. Rather than answering certain definite questions or solving particular problems, they are put in

an ordinary situation, and whatever happens is recorded. It is frequently possible to standardize the situation so carefully that many individuals can be compared at the same time under the same conditions.

Convenient examples of this method of observing human personality may be drawn from studies on dishonesty and cheating in games and in examinations. The most successful tests of honesty have involved the accurate observation of children in actual life situations where there was the possibility of acting in an honest or dishonest way.

One college teacher made it a practice to introduce slight errors in the totaling up of points earned in quizzes. Sometimes the error would favor the student; sometimes it would be in the opposite direction. (In all instances the true grade was recorded.) The object of the experiment was to see how many under-graded as compared with over-graded students would report the discrepancy. Observations over a period of two years showed that 97 per cent of the under-graded asked for corrections as against 9.5 per cent of those who were favored by the supposed error.

Another practical test of honesty consists in having children perform a task "on their honor"; the teacher leaves the room, giving them ample opportunity to cheat. A few days later the task is done again under close supervision precluding any opportunity to cheat. A child who has done well without supervision but who cannot repeat his own performance under supervision must have cheated the first time. The fact that his consciousness of guilt makes him nervous does not impair the validity of this method, since, had he not cheated originally, he would not feel guilty during the retest. Nothing is ever said or done to the cheaters. The object of such studies is not to trap the children. It frequently happens that the children never suspect the real nature of the "game."

### *Comparing Individuals*

SINCE THE NORMAL human individual has a healthy interest in himself, his abilities and his disabilities, his strengths and his weaknesses, he quite naturally wishes to compare his performance

with that of his associates. Although the society in which we live restricts our competitive efforts to certain acceptable modes of action, within the "rules of the game" our success in life depends to a large extent upon our own performance, as limited, of course, by opportunity. To facilitate the comparison of individuals' per-

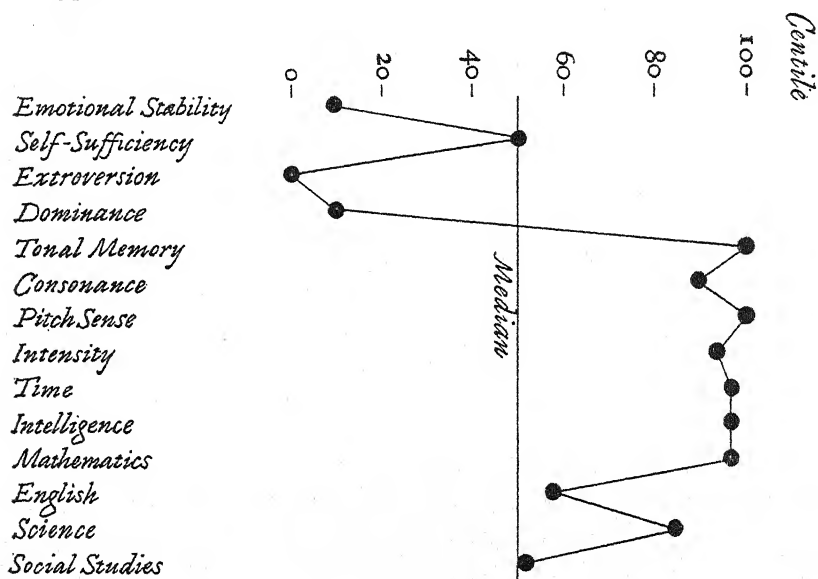


FIGURE 62. A Psychograph—which on analysis is much more revealing than a photograph. The young man whose psychological make-up is pictured here worked his way through college playing in a "swing band." He tried his hand at sales work and failed. He is now doing business-statistics research and is making good.

formances, psychologists have adopted certain standard procedures. The study which deals with these is called *statistics* and is a branch of applied mathematics. In this section we shall become familiar with some of the fundamental statistical concepts necessary to the scientific treatment of human behavior and experience.

### *The psychograph*

The psychograph, or psychological profile, is a chart picturing the psychological make-up of the individual as objectively measured or as rated by associates. By use of the psychograph the instructor or employer can get a good picture of the strengths and weaknesses of his student or employee. Figure 62 shows a typical

psychograph. At the side of this psychograph you will see that a number of psychological traits are listed. To the right of each of these trait names, you will see a point which describes the position of the person as compared with college students in general. Study this figure carefully and notice the traits in which he excels, those in which he is deficient. Could you predict from this information that the person in question might fail as a salesman and succeed as a statistical worker?

### *Statistical tools*

Exact statements about the abilities of an individual with regard to the group are made by determining the individual's place in relation to the average, or central tendency, of the group—i.e., whether he is above or below average, and how far.

*Measures of central tendency, or average.* The most familiar average is the one technically known as the *arithmetic mean*. To obtain the arithmetic mean, we add all the scores of a group of individuals and divide by the number of scores. There are two other averages with which the student should be familiar, the *mode* and the *median*. The mode is the score which is most often earned by the individuals in the group. The median is easily defined as the middle point of the group; in other words, the median is the point which separates the lower half of the cases from the upper half.

The student should study the following tabulation with great care to make certain that he fully understands these three most common measures of central tendency. The following table represents the scores earned by fifteen boys on a test of motor coördination. The scores are arranged in descending order to simplify working with them.

TABLE 34: *Scores of 15 Boys on a Test of Motor Coördination*

| NAME OF SUBJECT | SCORE | NAME OF SUBJECT | SCORE |
|-----------------|-------|-----------------|-------|
| John Brown      | 35    | Leonard Larson  | 23    |
| William Peters  | 29    | George Waters   | 23    |
| Peter Smith     | 26    | Robert Gray     | 22    |
| Francis Kelly   | 24    | Lowell Davis    | 22    |
| Frank Wright    | 24    | Charles Webster | 20    |
| Ernest Jones    | 23    | Wilbur Harvey   | 17    |
| Walter Evans    | 23    | Karl Reich      | 11    |
| Harry Hughes    | 23    | TOTAL.....      | 345   |



345 (the total of all of the scores) divided by 15 (the number of scores) gives 23, the arithmetic mean of this distribution.

A glance at the distribution will show that the score of 23 was earned by five subjects. The mode of the distribution is, accordingly, also 23, for no other score was earned so often.

There are fifteen scores in all. The middle one, therefore, is the eighth, that of Harry Hughes. His score, 23, constitutes the median, since that score falls at the point in the distribution which separates the upper half from the lower.

For the sake of simplicity, a distribution was selected in which the mean, median, and mode were all the same. This does not always happen, although distributions usually yield close to the same value for all three measures of central tendency. When the distribution is lop-sided, the mean and median will not coincide.

Perhaps you are wondering why we should bother with three kinds of averages instead of using only the familiar arithmetic mean. A full explanation would take us further into statistics than we should go in an elementary course. One example will suffice.

In Figure 63 you will see a frequency-distribution plot of annual family incomes in the United States.<sup>11</sup> Notice that there are many more families in the lower income brackets than in the upper. The *mean*-family income for 1936 was about \$1,622, while the *median* was only \$1,163. The median or the mode gives a more representative picture of central tendency than the mean in a badly skewed distribution curve such as this (a distribution the mode of which is toward one end rather than in the middle). Note that  $\frac{3}{16}$  of an inch on the base line stands for about \$250. Notice also that the distribution is cut off at \$10,000 per year. How much wider would the page have to be in order to plot an annual family income of \$1,000,000? Since the median does not take account of the exact magnitude of the scores, it is not affected by the few extreme and atypical cases which serve to raise the mean. When distributions are greatly skewed, we use the median or the mode rather than the mean as a measure of central tendency.

There are other situations in which the mode or the median may be employed where the mean cannot be calculated. Suppose that we are conducting an experiment on learning in which the

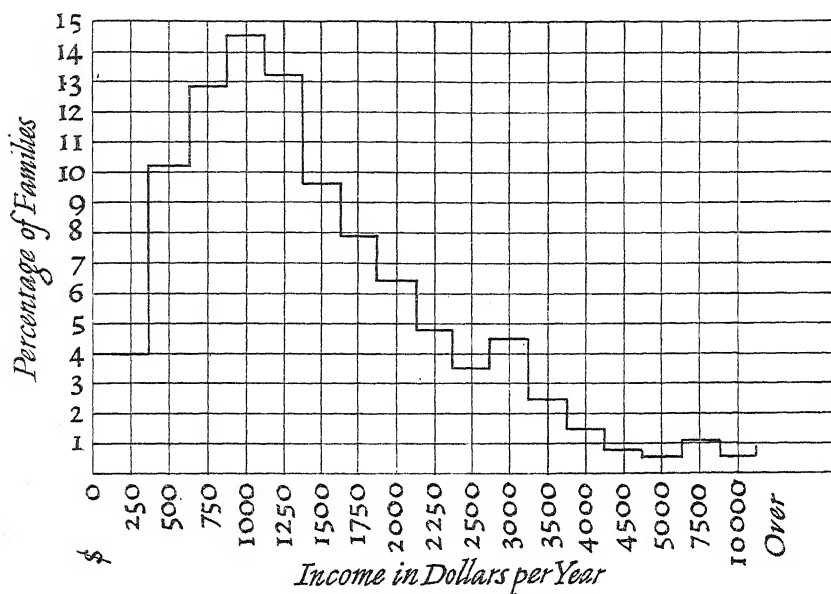


FIGURE 63. Family incomes in the United States for 1936—this is, a psychologist would say, a *Badly Skewed Distribution Curve*. Here you need to know the difference between mean and median.

learning ability score is the number of trials required to master a problem. Suppose that some of our subjects *never* learned it to the point of mastery. It would be impossible to calculate a mean under those circumstances, since to do so would require that the exact magnitude of each score be known. The median number of trials employed, however, could be calculated if half of the subjects had completed the learning task. The median, you will remember, is the point that separates the better from the poorer half of the cases. Obviously those who could not learn the task at all are poorer than those who could learn it even with a large number of trials and would be part of the poorer group.

The first step in comparing an individual with the group to which he belongs is to calculate a measure of central tendency in one of the ways described above. Knowing the average score and the individual's score, we can place him as *above* or *below* average.

*Centile scores are used to compare performances on tests.* Placing an individual above or below the average does not tell us all

we want to know about him. We usually want to know *how far* the person is above or below the average of his fellows. There are several ways in which this can be done, but the simplest method makes use of *centiles*, or, to employ a term meaning the same thing but passing out of use, *percentiles*. The 99th centile is the point below which 99 per cent and above which one per cent of the cases are found. The median is the 50th centile. By converting an individual's score on a test into a centile score, we know at a glance how many persons in the group fall below and how many above him in performance. That is to say, the individual earning the score is placed with regard to his group.

Thus when we look at the psychograph shown in Figure 62, we know at once not only that the young man's intelligence and mathematical ability are superior to his emotional stability but that he exceeds 98% of the population in intelligence and mathematical ability while being far below average in emotional stability—so far below that about 90% of the population are better than he.

### *Patterns in Personality*

ONE OF THE MOST persistent errors in the psychology of the layman is the notion that human beings fall into simple, sharply defined types. We have all heard, have all said: "You're not the type." We fall into the error of thinking of individuals as belonging to types because this is the easiest, most convenient way to think. If persons were all either angels or devils, geniuses or idiots, millionaires or paupers, we should not be obliged to give detailed descriptions of the morality, intelligence, or personality of our friends and associates. We should even be spared the necessity of studying the statistics you have just encountered.

#### *The bi-modal theory of types*

Most common in popular thought is a *bi-modal* theory of types, according to which all people divide into two separate and distinct groups when classified on the basis of any particular trait rather than differ from one another in small degrees. All people are thought to be either sane or insane, selfish or unselfish, honest or dishonest, brave or cowardly. The genius and the feeble-minded individual are thought to belong to two classes actually differing

in kind. This theory of distribution would require a curve of two or more modes such as that shown in Figure 64. (A mode, you will remember, is a point where individuals' scores "pile up," and a curve with two modes is one in which all the cases fall toward either one end or the other, rather than ranging in a continuous distribution with most cases concentrated near the center.)

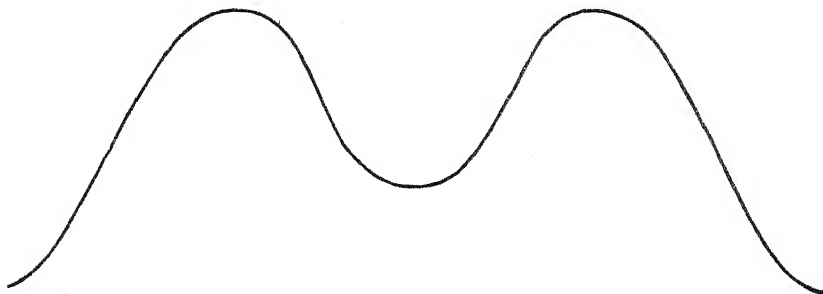


FIGURE 64. *A Bimodal Curve of Distribution is very rare in psychology, i.e., life.*

For comparison look at the curves shown in Figures 63 and 65. Hundreds of studies on individual differences have shown unimodal curves like these—curves having but one mode—to be more typical than the bi-modal distribution.

*The genius and the feeble-minded are not types.* The subject of human intelligence is one about which much false belief and superstition exist. The genius is so far above and the idiot so far below the average man that they appear to him to be different in kind. Careful measurement of large groups of people by means of standardized tests of intelligence shows that no sharp line of cleavage separates these three groups—the superior, average, and inferior—from each other. Instead we have a single curve with the few geniuses at one end, the equally few feeble-minded at the other, and the great majority of ordinary mortals in the middle.

*The sane and insane are not types.* "Everybody is a bit queer except me and thee, and at times thou art a bit odd, methinks." Thus spoke an anonymous Quaker philosopher to his wife. For psychology this expresses the thought that the sane and the insane are not separate types. Those of us who live on the outside of state institutions for the mentally ill like to think of ourselves as belonging to an entirely different group—the "normal type."

Psychiatrists and psychologists have attempted to find some characteristic behavior which is possessed or lacked on an all-or-nothing basis by the sane and the insane. So far their efforts have been unsuccessful. To be sure, certain traits are more likely to appear in individuals whose behavior has forced society to keep them in a state hospital than in those persons who can live comparatively happy and successful on the outside; but those very traits do appear to some extent in both groups. We say that "hearing things" (auditory hallucinations) is a symptom of insanity; but have you ever had the impression that someone has spoken your name, only to find that there was nobody in sight and that the thing was "all in your mind"? In certain cases of mental disorder the patient thinks that the whole world is plotting against him (delusion of persecution), and the mental disease "paranoia" is characterized by extreme feelings of self-reference; the patient considers casual remarks as carrying insults thinly veiled. Have you ever felt upon hearing laughter from a group of people whom you have just passed on the street that they were making fun of you? In some forms of the mental disorder "dementia praecox" there is often complete unawareness of the criticisms of others and a belief that one is flawless and all-powerful. When syphilis attacks the nervous system, it sometimes produces a set of symptoms which can include either extreme lack of self-criticism or exaggerated feelings of self-reference.

Have you ever had a dream so vivid that at the time you mistook it for reality, at least temporarily? This condition in the extreme is a symptom of insanity. But it is abnormal *only* when extreme.

Do you sometimes have fits of the blues or sudden periods of elation without any apparent change in your outside environment? These, experienced in intensified form, are the essential symptoms of manic-depressive insanity. The sane and insane are persons possessing the same traits, behaving in the same way, experiencing the same things; the difference is simply one of degree and control. The normal person is the more balanced person. That is the very essence of normality—balance—and even the layman has hit upon this fact, for he refers politely to an insane person as unbalanced.

Psychologists know that the feeble-minded grade into the normal in a continuous fashion; that no sharp line marks the sane from

the insane, although for lack of exact quantitative terms we are frequently forced to speak as though they were types. The important point is that we have reservations when we use the word. Once the fundamental distinction is understood, we can ignore it for convenience in speech, but when it comes to thinking about human nature in an exact way, we must be sure to remember that human traits vary by degrees and not by separate steps.

### *The distribution of traits within an individual*

We have just seen that individuals when compared with each other do not fall into sharply marked groups or "types." The next question has to do with the manner in which traits or characteristics distribute within a given individual. Will a particular individual possess all abilities to the same degree? Is an average person average in all of his traits?

Already we have seen one example in which this was not the case. Turn back to the psychograph shown on page 446. That young man was average in some characteristics, very superior in others, and very inferior in still others.

Hull has constructed a composite plot of the scores made by six "average" high-school students on 35 different tests.<sup>12</sup> Figure 65 shows this composite plot. In most of the tests these "average" students made average scores—scores falling around 75 to 85. A few scores of each individual, however, fell considerably above and a few others considerably below. Since Hull found this to be a fairly typical distribution, we are probably safe in concluding that the human individual is not equally superior in all traits, average in all traits, or equally inferior in all traits. The great majority of his traits fall close to his average, but in a few traits he will be exceptionally high and in a few others correspondingly low as compared with his own average.

Evidently a man is not uniformly superior, uniformly mediocre, or uniformly inferior. Within each individual there is some variation of capacities and abilities. This means that a person who is highly successful in one occupation might be only partially successful in another, or that a person who is moderately successful in an ill-chosen line of work might succeed exceptionally well if he were to engage in some other type of vocation.

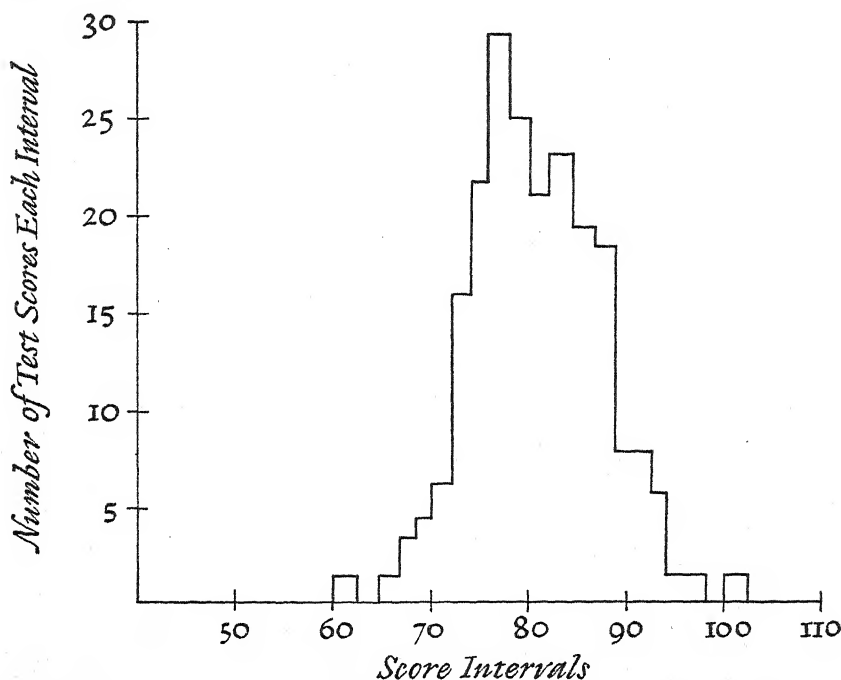


FIGURE 65. This is the way traits typically distribute within the individual. All-round superiority—or inferiority—evidently is hardly common. (After Hull: Aptitude Testing. World Book Company, 1928.)

### *How traits are associated, i.e., cluster*

We have seen that an individual is not altogether good, bad, or indifferent in all traits. Next we are interested in knowing the extent to which particular traits tend to be associated with each other.

Numerous studies in which various abilities and characteristics of people have been correlated show that the human individual is made up of traits which seem to go together in clusters involving an underlying specific or unitary ability. We do not yet know exactly how many of these clusters exist. There is good evidence, however, that intelligence constitutes one of these clusters of traits. Athletic ability, or motor agility, seems to be another. There is also some evidence for a cluster of traits which we can call mechanical ability. We do not yet know how many clusters of emotional and motivational traits exist, but researches are going on



now which we hope will bring the answer eventually. These clusters of abilities are made up of traits relatively independent of the traits of other clusters. For example, the various abilities which go into intelligence tests correlate with each other but are relatively independent of those which go to make up motor agility, mechanical ability, and certain other groups of personality traits.

*The correlation coefficient.* In order to study the problem of the relationships between various traits, it is necessary to understand what is meant by correlation. The *correlation coefficient* is a number which expresses the relationship between two sets of measures. In the present connection it is used to express the degree to which standing in one trait is in general associated with standing in another trait in a group of individuals. To compute a correlation, you need *two* sets of measures on a *group* of individuals. For example, if you wished to determine the degree of correlation between age and intelligence, you would have to know both the age and the intelligence score for each individual in the group. A correlation cannot be determined by using only one individual, because there will always be some individual differences between people in the relation between age and intelligence (or in the relation between any other two traits), and the particular individual you choose might not be typical of the group. The correlation is the general, *average* relationship found between those two traits in the group as a whole. If it is in general very close, the correlation is "high," and we can predict that in any individual chosen at random those two traits will *probably* be in close agreement. If the general relationship between traits *A* and *B* observed in the group is not so close, we cannot predict with so much certainty the standing of any given individual in trait *B*, knowing his standing in trait *A*. If we study a group and find no trend at all in general relationship between people's standing in the two traits, then there is no correlation at all, and no prediction is possible of what the relation will be in any particular individual.

When two traits of the persons in a group correlate perfectly and *positively*, we could line up all of the individuals on the basis of one trait and find them to be properly lined up for the other trait as well. If the correlation were perfect and *negative*, their order would be exactly the reverse in the case of the second trait.

The formula for determining the coefficient of correlation is written in such a way that  $+1.00$  means perfect positive correlation;  $0$  means no correlation whatever; and  $-1.00$  shows perfect negative correlation. In actual practice, correlations of  $+1.00$  and  $-1.00$  are rarely found. A  $+1.00$  or  $-1.00$  would mean that if we knew a person's score on one trait we could predict his score on the correlated one with perfect accuracy. You must by now see the advantages of high degrees of correlation in working with groups of individuals. Suppose that you found that the correlation between high-school record and college scholarship were perfect. You could then say to a student, "You made the highest grades in high-school; you will make the highest grades in college." Or, "You failed in high-school; you will fail in college." Unfortunately, the correlation between high-school and college scholarship is not high enough to permit such perfect prediction.

A coefficient of zero means that there is no relationship between the two traits, that there is no systematic connection between the two things in question. When the correlation between two sets of scores is zero, knowing one will not help you predict the other.

Correlation coefficients are not read as *percentages*. Suppose that test A and test B correlate  $.50$ . If you know an individual's score on test A, you can predict his score on test B fourteen per cent better than if you were merely guessing. Table 35 shows the accuracy of prediction possible on the basis of various correlation coefficients.

TABLE 35: *Accuracy of Prediction Based on Correlation Coefficients*

| CORRELATION COEFFICIENT | PERCENTAGE OF ACCURACY<br>OF PREDICTION |
|-------------------------|-----------------------------------------|
| .00                     | 00                                      |
| .50                     | 14                                      |
| .86                     | 50                                      |
| .99                     | 86                                      |
| 1.00                    | 100                                     |

Small differences between large coefficients are as significant for accuracy of prediction as much larger differences between small coefficients of correlation. For example, the difference between a coefficient of  $1.00$  and one of  $.86$  is only  $.14$  points, but it is as significant as the difference between a coefficient of  $.86$  and one of  $.00$ .

What does high correlation imply with regard to cause and effect? We cannot say that one thing causes the other merely on the basis of high or even perfect correlation. For example, the correlation between intelligence of identical twins is about .90. This does not imply that the intelligence of one of the twins caused that of the other. The better hypothesis is that the intelligence of each twin is determined to a large extent by the same group of factors, common heredity and similar home environment.

*All-round intellectual ability.* Very frequently we hear such statements as: "Smith is a genius in every field." Spearman, a distinguished British statistician and psychologist, points out that a careful study of the correlations between all kinds of intelligence tests would show whether or not there are general factors running through large groups of intellectual abilities.<sup>13</sup> In Table 36 you will find the correlations among eight different tests of intelligence. These figures are based on the scores of nearly a thousand recruits tested during the World War by the Psychological Board of the United States Army Medical Corps.<sup>14</sup>

TABLE 36: *Correlations among Various Tests in an Army Intelligence Test Battery*

| DESCRIPTION<br>OF TEST | NO. OF TEST | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    |
|------------------------|-------------|------|------|------|------|------|------|------|------|
| Directions             | 1           | 1.00 | .73  | .59  | .71  | .69  | .68  | .67  | .66  |
| Arithmetic             | 2           | .73  | 1.00 | .75  | .79  | .76  | .77  | .74  | .74  |
| Practical              |             |      |      |      |      |      |      |      |      |
| judgment               | 3           | .59  | .75  | 1.00 | .81  | .75  | .61  | .67  | .78  |
| Synonym-               |             |      |      |      |      |      |      |      |      |
| antonym                | 4           | .71  | .79  | .81  | 1.00 | .83  | .68  | .73  | .86  |
| Disarranged            |             |      |      |      |      |      |      |      |      |
| sentences              | 5           | .69  | .76  | .75  | .83  | 1.00 | .67  | .78  | .82  |
| Number series          | 6           | .68  | .77  | .61  | .68  | .67  | 1.00 | .70  | .69  |
| Analogies              | 7           | .67  | .74  | .67  | .73  | .78  | .70  | 1.00 | .67  |
| Information            | 8           | .66  | .74  | .78  | .86  | .82  | .69  | .67  | 1.00 |

Notice that all the correlation coefficients are positive and fairly high. This consistency of positive correlation indicates that some common factor is running through all the tests. The nature of this

factor is not to be implied from the mere fact of its existence. It might be high motivation; that is, those individuals who consistently work as hard as they can would do well on all of the tests, while those who work less hard would tend to do poorly on all. Or it may be a particular way of attacking problems. But whether the factor is one of high motivation or of so-called native intelligence—or a combination of both—it is there, which is the important thing from the standpoint of individual differences.

Numerous studies of the correlations of different types of intelligence give us a very convenient formula to visualize the pattern of human personality in so far as intelligence is concerned:

$$\text{Intelligence} = G + p_1 + p_2 + p_3 \dots \text{etc.}$$

Translated, this means that intelligence is made up of a general ability ( $G$ ) running through all the tests plus many primary abilities ( $p_1$ ,  $p_2$ , etc.) which are left after  $G$  is eliminated. A primary ability is independent of every other primary ability and, of course, independent of  $G$ . Though you are high in one primary ability, you can stand anywhere on any other. In the case of intelligence, three primary abilities are known.<sup>15</sup> These are intelligence in dealing with words, with numbers, and with relations.

**A.** Verbal intelligence. Certain persons are good with words. They have the "gift of gab." They talk well, write well, and think well in situations calling for the use of verbal symbols. A person high in verbal intelligence does well on tests such as defining words; supplying words of similar or opposite meaning to given words; rearranging scrambled sentences such as, "Horses have feathers all"; following oral and written directions to do tasks of varying grades of complexity. In Table 36 on the preceding page, tests 4, 5, and 8 call for verbal intelligence.

**B.** Numerical intelligence. Ability to use numbers is called numerical intelligence. Addition, subtraction, multiplication and division, and the more complicated mathematical manipulations are dependent upon this type of intelligence. Solving story problems in arithmetic requires both verbal and numerical intelligence.

**C.** Relational intelligence. Ability to see relationships among words, numbers, or objects in space is a specific dimension of intelligence. It is not correlated with the numerical and verbal types.

The form of the material may vary widely; the ability to see relations operates where relations are there to be seen no matter what kind of material is used in the test.

The following are examples of tests of relational intelligence:

Complete the following series of numbers:

|   |   |    |    |    |       |
|---|---|----|----|----|-------|
| 1 | 3 | 5  | 7  | 9  | _____ |
| 2 | 4 | 8  | 16 | 32 | _____ |
| 5 | 9 | 17 | 33 | 65 | _____ |

Complete these analogies by underlining the best answer:

Mare is to colt as mother is to:

son                      daughter              child                      parents

Addition is to subtraction as multiplication is to:

division                  addition                  subtraction                  computation

$\vdash$  is to  $\perp$  as  $\dashv$  is to:

Other types of intelligence have been described but are not so generally agreed on as these three which have been found in so many different studies.

*All-round mechanical ability.* We have seen that scores earned on intelligence test batteries show a high degree of correlation with each other. Is there a similar cluster of mechanical abilities? Perhaps the best information on this important subject can be drawn from the results of the Minnesota Mechanical Ability Investigation conducted by five psychologists working in close coöperation.<sup>16</sup> In this extensive investigation a large number of tests were given to groups of subjects and the results analyzed by statistical methods. We are here concerned with the results rather than with the methods these workers employed. Some six tests of mechanical ability were discovered which showed high correlations with success in such work as electrical wiring, manual training, and shop practice. These six tests were all correlated positively with each other. In other words, evidence was obtained that *there is a cluster of mechanical abilities which go together*, just as certain intellectual abilities form a pattern. We have in the results of the Minnesota investigation convincing proof that there is in reality an all-round clever person in mechanical work.

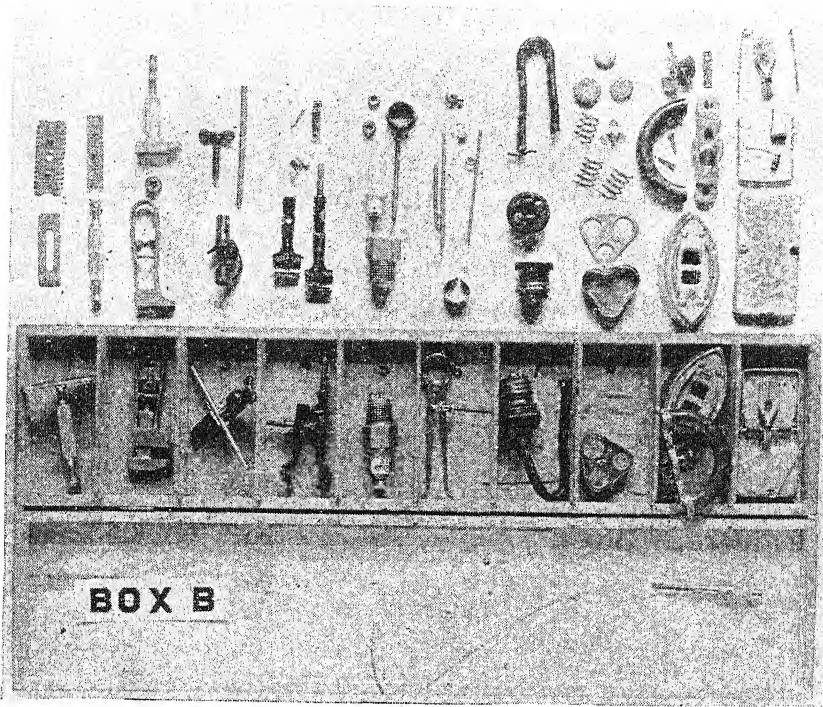
Figure 66 shows two of the tests of mechanical ability which were included in the Minnesota study. One picture illustrates a test of ability to assemble familiar mechanical devices. To make clear the nature of the operations involved in this test, the unassembled parts as well as the correctly assembled objects are shown. At the left, for example, you see the parts of a safety razor and, below it, the assembled article itself. The subject is given the unassembled parts, and he puts them together as rapidly and as well as he can. In the other test shown in Figure 66 the subject packs the blocks into the box as rapidly as he can. This operation closely resembles many factory jobs such as packing soap, cigarettes, or other small articles into cases for shipment.

It is interesting to learn that steadiness of the hand does not correlate with mechanical ability in general. Hand steadiness is measured by a simple apparatus which consists of a metal plate in which nine holes of differing sizes are drilled. The subject attempts to place a needle in the holes without touching the sides of the holes. The score is determined by the number of times he touches the sides of the holes in putting in the needle and holding it there for a few seconds. The size of the hole determines the difficulty of the task.

How does the cluster of mechanical abilities relate to the cluster of abilities which we call intelligence? Can we assume that a man or woman will have mechanical ability if he or she is a person of high intelligence? If we could, the task of selecting people for skilled work would be easy. All we should have to do in that event would be to administer a good intelligence test and pick out those individuals who scored highest. The Minnesota Mechanical Ability Investigation found no such correlation. General intelligence and mechanical ability are quite independent of each other.

The fact that those people who are high in the cluster of mechanical abilities may be of low as often as of high general intelligence provides a reasonable justification for the practice which is growing in our public schools of allowing those pupils who do poorly in academic subjects to try their hands at vocational training. Of course, we cannot argue that a pupil will succeed in vocational work simply because he is below average in intelligence, but we can expect that many pupils will do so just as a matter of

chance, since mechanical ability and general intelligence are not correlated.





*All-round athletic ability.* Is there such a thing as an all-round athlete? We know that certain individuals excel in a large number of sports, while others fail in all. We cannot assume merely on the basis of this fact, however, that there is a general factor of athletic ability that makes for excellence in all sports. Even if the correlations between the various athletic abilities were zero, it would be possible for a few individuals to excel in all the abilities by virtue of the chance association of the desirable abilities. We must not attempt to answer this question by thinking of an exceptional person who may or may not follow the rule.

Paterson and his colleagues report the intercorrelations of tests of athletic ability given to 100 junior high school boys.<sup>16</sup> The battery of tests covered running the hundred-yard dash, strength of the back, strength of the right and left hands, broad jump, and the twenty-five-yard hop. The correlations between the pairs of these tests were all positive, and some of them were fairly high. This finding gives strong support to the idea that *there is a cluster of abilities which go to make up an athlete, that there is all-round athletic ability.* Correlations were low between general intelligence and each of the traits in the cluster constituting athletic ability, or motor agility, a fact further indicating the reality of this cluster. A more recent study by Seashore, Buxten, and McCollom suggests the existence of three primary abilities in this motor agility cluster: strength, quickness, and steadiness.<sup>17</sup>

*Is there all-round musicality?* Seashore and Mount determined the correlations between the various pairs of a series of measurements of the factors in musical ability, such as pitch discrimination, sense of time, tonal memory, and many others.<sup>18</sup> These elements represent essential abilities in learning to play musical instruments. Their intercorrelations are so low that we find no evidence of a cluster representing general musicality such as is found clearly in the case of intelligence and less clearly in mechanical ability and motor agility. All in all, the evidence from this early investigation and from more recent ones indicates that *there is no all-round musical ability.* The good musician is the one who happens to possess enough of the basic abilities. The fact that one is high in a few of these elementary abilities does not mean that he will be high in the others. Certain of the needed abilities of the musician, however, are apt to go with certain others.

People who are good in discriminating pitch are likely to excel in memory for combinations of tones and, of course, in ability to sing a particular note at will. Rhythm, however, is not correlated with pitch discrimination. The senses of pitch, intensity, time, consonance, rhythm, and memory for tones are all unrelated to general intelligence.<sup>19</sup>

The various musical instruments make different demands upon the abilities of the performer. The pianist need not have the high sense of pitch required of the violinist or the vocalist. He does require a good sense of rhythm and intensity, but he does not need good tonal memory since he can have his music before him as he plays.

A good musician must have intelligence as well as the basic sensory abilities. In general, composers are more intelligent than performers; instrumentalists, more intelligent than vocalists.

*Introversi-on-extroversion.* We all know individuals whom we would call *introverts*. The introvert lives within himself. He is interested in ideas, values, and general principles. He is given to day-dreaming and reverie. He is not especially interested in people unless they have ideas. Artists, musicians, scholars, and scientists are usually more or less introverted. At the other extreme are the individuals we call *extroverts*. The extrovert reacts mainly to the external world. He is interested in people and things rather than in ideas and values. He likes people, and he wants to be liked. He would rather make the world go round than understand why it goes round. He is the practical sort of a person and is bored with, or even annoyed by, theory.<sup>20</sup> The following items are taken from a test of introversion-extroversion. The introverted answers are marked (i), the extroverted, (e).

1. Do you prefer to work alone rather than with others? YES (i)  
NO (e)
2. Do you keep in the background at parties? YES (i) NO (e)
3. Do you think that the world is pretty good the way it now is?  
YES (e) NO (i)
4. Do you keep a diary? YES (i) NO (e)
5. Can you express yourself better in speech than in writing? YES (e)  
NO (i)
6. Do you like people? YES (e) NO (i)
7. Are you careful about making loans? YES (i) NO (e)

8. Do you like to take charge in an emergency? YES (e) NO (i)
9. Do your friends consider you stubborn? YES (i) NO (e)
10. Are you a conservative in your political views? YES (e) NO (i).

Of course one introverted answer does not make you an introvert. No one is completely introverted or extroverted. As with other traits we find not types but a continuous distribution with most of the cases near the center. The normal person becomes more introverted or extroverted as the situation demands but tends to lean one way or the other most of the time. There is good evidence that within the trait of introversion alone there are sub-traits or kinds of introversion. Guilford and Guilford analyzed the responses of 930 subjects to the items of an inventory of introversion-extroversion.<sup>21</sup> Their elaborate statistical analysis indicates three sub-traits of introversion-extroversion. The first of these might be called *retreat* and is typified by a *yes* answer to the following question: "Are you inclined to keep in the background on social occasions?" The second sub-trait might be called *impulsiveness* and is represented by the following item: "Do you get rattled easily in exciting situations?" The third sub-trait is more difficult to name, but we might call it *expression*. A *yes* in answer to the question, "Do you express such emotions as delight, sorrow, anger, etc., readily?" exemplifies this sub-trait of introversion-extroversion.

✓ **Morality.** Morality is another personality trait. To behave morally is to behave in the way that society approves. When a person obeys the rules and laws of his society, we say that he is *moral* or good; when he disobeys, we say that he is *immoral* or bad. We must draw another distinction to cover the individual who because of low intelligence or unfamiliarity with the code sometimes violates it. Such a person is called *amoral* (lacking in morals) and is not classed as either good or bad.

Since the very beginning of recorded history, people have been much interested in problems of moral philosophy and practical ethics. Much of the greatest literature produced by man has been concerned with the recording and interpreting of morals. The Old Testament, the Koran of the Mohammedans, the Rig Veda of the Buddhists; and the Talmud of the Jews are largely devoted to problems of moral principles and ethical conduct. It has been only

during the present century, however, that men have attempted to study moral behavior by scientific methods.

The most noteworthy attempts to study moral behavior are those of Hartshorne, May, and their associates.<sup>22, 23</sup> These workers observed the actual behavior of children in life situations which had been carefully arranged to permit of acceptable and unacceptable behavior. Children were given an opportunity to *lie*, *steal*, or *cheat* in a game or examination.

There is no high degree of consistency in the moral behavior of children. Children who would cheat in one situation might be honest in another. Children who cheat in a school examination are not much more given to stealing than are children who do not cheat. Older children are more inclined to deceit in its various forms than are younger children. Children of higher intelligence are more honest than children of lower intelligence. Children from the better and wealthier homes cheat less than those from less favored homes. This is true even when the intelligence level of the two groups is held constant. Deception tends to run in families and in classes at school. Children from good homes placed on their honor cheat more at school than at home, while children from poor homes cheat less at school than at home. There is no relationship between deception and attendance at Sunday School. Those who go to Sunday School cheat just as frequently as those who do not. Among the various denominations of Sunday Schools represented no differences were found in amount of cheating, lying, or stealing.

There is no evidence of a general factor of morality such as we have seen in the case of intelligence, athletic agility, mechanical ability, and introversion-extroversion. Morality seems to be more a matter of the type of training that a child receives in the home and at school than of some inherited constitution.

Strength of character. Cattell and others have conducted elaborate researches which seem to indicate that there is a trait of personality which can be called "will-power" or strength of character.<sup>24</sup> The essential data of Cattell's researches were the estimates of college students of their fellows. The subjects were asked to tell which of a list of trait names applied to a particular individual. The analysis of the results showed that a series of traits seem to go

together to form a cluster which appears to be independent of intelligence and possibly of other clusters of personality traits. The traits which form this general cluster of strength of character are *persistence, energy, tact, maturity, willingness to forego pleasure, confidence, and kindness*. Cattell's results, based on ratings, are not entirely consistent with those of Hartshorne and May, based on actual tests of behavior, a fact which suggests that the groupings may in reality exist in the minds of the raters rather than in the persons rated. Although Cattell used intelligent judges who were carefully instructed to disregard any preconceived notions as to the associations between personality traits, it is quite probable that they were not entirely able to follow out those instructions even though they tried hard to do so. We can be certain of the patterns in which personality traits group themselves only when we find those patterns in the actual behavior of people or in the relationships between objective tests of personality. It is impossible at the present time to conclude whether or not there is a cluster of moral or character traits.

### *Constitutional factors and personality traits*

The notion that certain body types or other physical traits tend to be associated with certain patterns of mental and personality traits is very old.

*Body types.* Fat men, so goes the popular belief, are good-natured and little given to reflection or introspection; thin men are supposedly irritable and thoughtful. Shakespeare expresses this view in *Julius Caesar*.

Caesar: "Let me have men about me that are fat;  
Sleek-headed men, and such as sleep o' nights;  
Yond' Cassius hath a lean and hungry look;  
he thinks too much; such men are dangerous."

Antony: "Fear him not, Caesar; he is not dangerous;  
He is a noble Roman and well given."

Caesar: "Would he were fatter! . . ."

One very old classification makes people sanguinary, phlegmatic, choleric, or melancholic according to the preponderance of red bile, yellow bile, green bile, or black bile in their systems. Another attempt at grouping people into types makes use of three categories: the digestive type; the brainy type; the sanguinary type.

According to this scheme we fall into one of these three groups depending on whether our stomachs, our nervous system, or our hearts and blood vessels are outstandingly developed. These systems of classification have no scientific validity. They are merely of interest in showing the tendency of people to classify each other in types.

One of the more popular modern schemes is that of Kretschmer. According to this theory everyone belongs to one of three body types; one is either "leptosome" (long-bodied), "pyknic" (round-bodied), or "athletosome" ("ideal"). Personality patterns are thought to be different for the three groups and if an individual becomes insane, the type of insanity he will develop will, supposedly, depend on which of the three types he belongs to. Numerous investigations in this country have shown such claims to be groundless as long, at least, as we deal with the general population.

One of the most comprehensive studies in this field was that of Klineberg, Asch, and Block, who administered to adequately large groups of college students a series of tests designed to measure the traits of the supposed types.<sup>25</sup> Following the specifications laid down by Kretschmer, these students were classified into three groups on the basis of body measurements. The differences in test scores did not square with those predicted by the Kretschmer theory and were generally so slight as to be attributable to chance.

Cabot studied 212 boys from graduating classes in three city high schools.<sup>26</sup> Nine pyknomes, twenty-eight leptosomes, and twenty-five athletosomes were selected by agreement among five judges. Various tests and rating devices were used. On the whole no conclusive evidence was found to support Kretschmer. The type theory of Kretschmer, like the theories of phrenology, has grown up out of insufficient critical analysis of data.

*Is there a biochemical basis of personality?* Is it possible to measure personality by chemical analysis of the blood? The interesting and somewhat spectacular effects of deficiency or overactivity of the endocrine glands have caused many a physician and psychologist to speculate on the possibilities of developing chemical tests for personality. So far, such efforts have been completely disappointing.<sup>27</sup> Numerous attempts have been made to find correlations between such traits as good-naturedness, perseverance, leadership, aggressiveness, and excitability (as measured by standard-

ized tests or as rated by associates) on the one hand and such chemical conditions as acidity of the urine or saliva, etc. Correlations obtained have been so low that they are best attributed to chance. The chemical tests are usually very complicated in nature and require a great deal of a trained technician's time. This fact makes impossible the use of large samples of subjects. It is quite possible that the future will bring refinements of technique of physiological chemistry and perfected mental tests which together will permit the discovery of significant relationships between the chemical conditions of the blood and traits of personality. Just now the evidence is negative.

*Summary*

Personality may be defined as the effect that a person has upon others, i.e., as a person's social stimulus value. But there is a more penetrating definition of personality which looks beyond external appearance to see how the individual affects himself as well as others—and how others affect him—in the give and take of social relations. This broader and deeper definition takes account of the person's whole inner organization, including habits, abilities, attitudes, and ambitions.

Personality is measured by means of psychological tests, rating scales, interviews, self-inventories, and behavior sampling. To be of any value, these measuring instruments must possess validity and reliability. Psychological tests are more precise than any of the other four instruments of measuring. In both rating scales and interviews precautions must be taken to avoid errors deriving from the "halo-effect" and the effects of "stereotypes." Self-inventories must be validated against observed behavior and against ratings made by others who know the individual.

When a large group of persons of the same age are measured by means of any psychological test and their scores plotted into a distribution curve, we see that there are more cases clustering around the mean than there are falling either far above or far below. People do not fall into sharply defined classes or types. The sane merge into the insane; the bright differ from the dull in degree only, and every degree of difference is represented in any large group of people. Some traits of personality will correlate highly



with certain others and be independent of still others. The general rule is that desirable traits are positively correlated or else independent. There are certain clusters of ability which usually go together. We do not know yet how many of these clusters exist, but there is evidence that intelligence, athletic agility, and mechanical ability all constitute such clusters of traits.

### *Recommended Readings*

GARRETT, H. E., and SCHNECK, M. M. R. *Psychological Tests, Methods and Results*. Harper, 1933.

The title tells what you will find here; authoritative and accurate.

GUILFORD, J. P. *Psychometric Methods*. McGraw-Hill, 1936.

Do not attempt this excellent survey of the uses of statistical methods in psychology until you have laid a firm foundation in mathematics.

HULL, C. L. *Aptitude Testing*. World Book Company, 1928.

With a firm grasp on your high-school mathematics you will be able to read this book with understanding. If mathematics bores or troubles you, you will never get very far into the subject of aptitude testing.

LOCKHART, E. G. *Improving Your Personality*. Walton, 1939.

An exhaustive practical handbook on the improvement of the personality. It considers such problems as how to control emotions; how to become a good conversationalist; the nature of preventable personality disorders. For the general reader.

PREU, P. W. *Outline of Psychiatric Case-Study*. Harper, 1939.

A comprehensive guide to history-taking and mental and physical examination. Highly recommended for students interested in clinical psychiatry.

SCHOEN, M. *The Psychology of Music: a Survey for Teacher and Musician*. Ronald Press, 1940.

Smoothly written with a slight hereditarian bias.

SPENCER, D. *Fulcrum of Conflict; a New Approach to Personality Measurement*. World Book Company, 1939.

Personality measurement as revealed by the discrepancies between the individual's test scores and his self-report on his own behavior.

STOGDILL, E. L., and HERNDON, A. *Objective Personality Study*. Longmans, Green, 1939.

This is a work-book designed to give the student an opportunity to apply mental hygiene principles to himself.

TERMAN, L. M., and COX, C. M. *Sex and Personality*. McGraw-Hill, 1936.

Sex differences in personality are of universal interest. Here is one approach to their description.

THURSTONE, L. L. *Primary Mental Abilities*. University of Chicago Press, 1938.

Research on an extensive scale involving factorial methods applied to man's primary abilities. For the serious student who knows mathematics.

VERNON, P. E. *The Measurement of Abilities*. University of London Press, 1940.

An overview introduction to one of the most active fronts in modern psychology.

"The hand that follows intellect can achieve." MICHELANGELO

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## CHAPTER 13

# INTELLIGENCE

*Intelligence—mental power—brain power—I.Q.—abstractions behind the reality of action. The psychologist understands intelligence as the engineer understands electricity. Neither knows quite what he is dealing with except in terms of what it will do. How intelligence is measured and how its development is guided by heredity and environment.*

TO THE PSYCHOLOGIST, the word *intelligence* is not mysterious, at least no more mysterious than is the word *electricity* to the engineer. Neither the psychologist nor the engineer worries too much about his inability to prepare an acceptable definition of the force with which he works. Each is content in the knowledge that he is dealing with something that can be measured, studied, and understood through the effects of his action.

Intelligence, as used by the psychologist, includes all those abilities through which we acquire, retain, extend, and apply our knowledge. Thus intelligence comes to include perception, memory, imagination, judgment, and learning. In other words, a person's intelligence is his capacity to adjust to new situations for

which he has at his disposal no ready-made, previously practiced response, by making use of what he has learned in the past. The psychologist measures an individual's intelligence by putting him in new problem situations and observing how quickly and how accurately he adjusts as compared with other individuals in the group to which he belongs. These problem situations are scaled in difficulty and are known as intelligence tests. (See page 485.)

The intelligence test today is barely twenty-five years old, yet it has already become one of the most important devices for giving an individual information about himself in order that he may plan his life, predict the probable outcome of his various efforts, and gain similar insight into the efforts of others. The intelligence test today is used in business and industry as a basis for hiring or refusing to hire. It is used in the schools to classify pupils into slow-learning and quick-learning groups. The experiences of the World War have left no doubt that a thoroughgoing, scientific intelligence testing program is essential in the mobilization of an efficient military force.

### *Levels of Intelligence*

WHEN PEOPLE HAVE extremely high intelligence, we call them geniuses. Those with very low intelligence are called feeble-minded. Certain persons are extremely uneven in their intellectual development, but most people are about average in most of their abilities. The following cases illustrate three levels of intelligence and a case of uneven development of intelligence. Careful study of these cases can leave no doubt that people differ widely in mental ability, though it should be kept in mind throughout that the differences are always in degree rather than in kind.

#### *Philippa Schuyler, a case of very superior development<sup>1</sup>*

Let us get acquainted with a remarkable child of superior development as seen by the *New Yorker's* Reporter at Large.

Philippa Duke Schuyler is nine years old. Her mental age, according to the Clinic for Gifted Children at New York University, which tests her periodically, is sixteen. She has an I.Q. of 185. Philippa reads Plutarch on train trips, eats steaks raw, writes poems in honor of her dolls, plays

poker, and is the composer of more than sixty pieces for the piano. Most of these compositions are descriptive, with such titles as "Spanish Harlem," "Men at Work," "The Cockroach Ballet," and "At the Circus." She began composing before she was four, and has been playing the piano in public, often for money, since she was six. . . .

Philippa is in Grade 6A. A child psychologist who examined her last winter said that she could easily do ninth-grade work, but her parents decided she shouldn't do any skipping. . . .

One day Philippa said to her mother, "Do you remember that silly little riddle book I bought at the newsstand in the station at Cincinnati and never got a chance to look at?"

"Yes, I remember."

"Well, I've just been looking through it, and some of the riddles are funny. May I ask one, please?"

Mrs. Schuyler nodded, and Philippa asked, "What has four wheels and flies?"

We were silent a minute, and then Philippa said impatiently, "Give up, please, so I can tell you."

"We give up," Mrs. Schuyler said.

"A garbage wagon," Philippa said.

Mr. Schuyler groaned, and Philippa looked at him and burst out laughing.

"Was it that bad, George?" she asked. "Wait until you hear some of the others."

"Not now, Philippa," Mrs. Schuyler said, rather hastily. "Instead, maybe you'd like to play for us in your room."

"I'd like to very much," Philippa said.

Mr. Schuyler said that he would stay in the living room and listen. Mrs. Schuyler and I followed Philippa down the hall. . . .

On top of Philippa's piano there was a Modern Library giant edition of Plutarch, a peach kernel, a mystery novel called "The Corpse with the Floating Foot," a copy of the New York *Post* opened to the comic-strip page, a teacup half full of raw green peas, a train made of adhesive-tape spools and cardboard, a Stravinsky sonata, a pack of playing cards, a photograph of Lily Pons clipped from a magazine, and an uninflated balloon. I was standing beside the piano, examining this rather surrealistic group of objects, when Mrs. Schuyler . . . said, . . . "I'll leave you two alone for a few minutes. Philippa, don't start playing until I get back." I took one of the chairs, and Philippa sat on the piano bench. Left alone with her, I felt ill at ease. I didn't know how to go about making small talk with a gifted child.

"Do you mind if I smoke in here?" I asked her.

"Of course not," Philippa said. "I'll go get you an ash tray."

When she returned, I asked her if she had been reading the Plutarch on the piano.

"Yes," she said, "I've read most of it. I got it to read on trains."

"Don't you find it rather dry?"

"Not at all. I like biography. I particularly like the sections called the comparisons. Best of all I liked Theseus and Romulus, and Solon and Poplicola. Plutarch is anything but dry. I'm very interested in the Romans. I want to get 'The Decline and Fall' next. It's in the Modern Library, too."

"What are some other books you like?"

Philippa laughed. "Lately I've been reading a Sherlock Holmes omnibus and some mystery books by Ellery Queen."

"What book do you like best of all?"

"Oh, that's almost impossible to answer. You can't just pick out one book and say you like it better than all others. I bet you can't."

"I certainly can," I said. I was not bothered any longer by the difference in our ages, and had completely got over feeling ill at ease.

"What book?"

"Mark Twain's 'Life on the Mississippi,' " I said.

"Oh, I like Mark Twain," Philippa said, clapping her hands excitedly. "I like him very much. I guess you're right. I *can* say that there's one book I like best of all. That's the 'Arabian Nights.' George has an eight-volume set. It's an unexpurgated edition. I read it first when I was three, and at least four times since. I based my longest composition on it. I called it 'Arabian Nights Suite.' Oh, the stories in that book are absolutely wonderful!" She laughed. "Goodness!" she said. "I didn't mean to get so"—she paused and appeared to be searching for a word—"impassioned."

Mrs. Schuyler returned, and sat down. . . . "Are you ready to play for us?"

"Yes, Jody," Philippa said, getting to her feet. She turned to me, curtsied, and said, "Think about cockroaches while I'm playing this piece. It's 'The Cockroach Ballet.' This is the story: Some cockroaches are feasting on a kitchen floor. A human comes in and kills some of them. He thinks he has killed them all. But after he leaves, one little cockroach peeps out, then another, and another. They dance a sad little dance for their dead comrades. But they aren't very sad because they know that cockroaches will go on forever and ever. Unfortunately."

Mrs. Schuyler laughed. "Philippa took that piece to Mother Stevens at Sacred Heart the afternoon she wrote it," she said. "Mother Stevens is head of the music department. She asked Philippa why she didn't write

about angels instead of cockroaches. 'But dear Mother,' Philippa said, 'I've never seen an angel, but I've seen many cockroaches.' "

Philippa curtsied again, sat down at the piano, and began playing. . . . "Here's one called 'The Jolly Pig,' " she said. In the middle of it she turned to me and asked, "Hear him laughing?" I didn't, but I said I did. After that came the "Caprice" she had finished that day. Then she played some pieces by other composers. They included Rimsky-Korsakoff's "Flight of the Bumble Bee" and Johann Sebastian Bach's "Two Part Invention No. 1." After she had played for at least half an hour without any sign of weariness, she said, "I'll play just one more, one I composed a long time ago, when I was four years old. It's 'The Goldfish.' A little goldfish thinks the sky is water. He tries to jump into it, only to fall upon the floor and die."

Mrs. Schuyler . . . called to Mr. Schuyler and he came in and sat down on the bed.

"I liked your new piece, Philippa," he said. Philippa smiled proudly.

"Thanks, George," she said. "I'm going to do a little more work on it tomorrow." . . .

Mr. Schuyler looked at his watch. "It's nine-thirty, Philippa," he said. . . .

We said good night to Philippa. . . . Mr. Schuyler and I went into the living room. I asked him how many hours a day Philippa studies. He said that during school months she gets up at seven-thirty, has a bath and breakfast, and starts practicing on the piano at eight. She practices for two hours. Then for half an hour she plays anything she likes. At ten-thirty her music supervisor arrives. The supervisor, a young piano teacher named Pauline Apanowitz, is with her an hour and a half. Shortly before one, Philippa walks to Sacred Heart, eating green peas on the way. She spends two afternoon hours a day at the convent, attending history, geography, and English classes. She misses arithmetic, spelling, and reading, which are morning classes. However, her examination grades are always good in the subjects she skips. She is, of course, an honor student. "There wouldn't be much point in Philippa going to a spelling class," Mr. Schuyler said. "When she was twenty-nine months old she could spell five hundred and fifty words. She has an enormous vocabulary. She likes jaw-breakers. At four, she discovered the scientific word for silicosis, which is pneumonoultramicroscopicsilicovolcanoniosis, and she spelled it morning and night. It fascinated her. We certainly got tired of that word." . . . Most afternoons she spends an hour in the convent playground; rope-skipping is her favorite exercise. . . .

Mrs. Schuyler came into the room, bringing several small books. "When Philippa was very little I kept a careful account of the stories and



poems she wrote, the words she invented, the questions she asked, and such things," she said. . . .

I opened one. At the top of the page was written "Three years, seven months." Beneath this was the following notation:

"You are very interested to know why some people are good and some bad. "What do they do with bad people?" you ask. "If they are very bad, they put them in jail," I say. "What is a jail?" you inquire. "A jail is a building full of little rooms with barred doors." "What do they do to bad people in jail?" "They don't have nice things to eat or wear," I explain. Several days later you heard about how poor most people are in Georgia, and you asked, "The poor people in Georgia who have nothing nice to eat or wear, are they bad?" "No," I said. "They are not bad. They are unlucky. Later, I will explain more fully." That afternoon you laughed and asked, archly, "Jody, when the weather is bad, do they put it in jail?" The same day you asked if flowers get white hair when they are old. And you asked if people who sleep on cots say at night, "I am going to cot." And you asked if mothers ever say to their children, "You must go crooked to bed." Walking along the street you said, "Jody, trees stand on one leg." Yesterday you began to giggle. "There's no Mr. Lady or Mrs. Man," you said, and enjoyed the humor of the idea very much. Today you made up a poem.

"Pipes are steel,  
But bones are real."

Tonight you sat on the floor and made up a long story. You said, "Varnetida, a little girl, and her mother, Armarnia, went to see Slowbow, a brother who lived with his father, Solom, in a big house in Channa. They met the grandmother, Branlea, and another little girl, Jolumbow, who had a kitten named Lilgay, and a dog named Cherro. They all sat down in a chilbensian room and ate dishes of wallaga and thaga . . ." and so on, as long as I would listen. If you were at loss for a word you simply invented one with a perfectly solemn face.'

I picked up another book. In it I found a poem Philippa wrote when she was five. She wrote it on Easter morning while sitting in the bathtub:

"The sun is lifting his lid.  
The sun is leaving his crib.  
The sun is a waking baby  
Who will bring the Spring maybe  
Thump, thump, thump! out of the earth."

The poem was followed by this notation:

'Tonight a red light flashed to green while we were walking across Fifth Avenue. The automobiles were whizzing by us. Suddenly you looked up and said, "Jody, will you please name for me all the diseases in the world?"'

"Philippa must be difficult to deal with at times," I said.

"She is indeed," Mrs. Schuyler said. "People often tell me, 'You must not push her!' Their sympathy is misplaced. If there's any pushing to be done, she does it. We make it a rule to answer all her questions as simply and frankly as possible. If we ever answer the same question two ways, we have trouble. Once, because I was dead tired, I refused to answer one of her questions. She kept on asking it. I kept account, and found that she asked it thirty-four times one way and six times another way." . . .

JOSEPH MITCHELL

### *Henry Evans, a man of average intelligence*

Henry Evans is a man of average intelligence.

Evans is a good mechanic who earns between four and five dollars a day, depending upon how much work comes into the shop. He hopes to increase his earnings when the depression lifts. He is thinking of moving to a larger city where opportunities will be better in his line, but is reluctant to throw up a good steady job until he is sure that he has something better.

Evans had some difficulty in getting through high school. He did well in his shop courses, but failed often enough to make it necessary to spend five years in high school. Upon completion of his high-school course he worked for three years at various jobs, then decided that his lack of education was holding him back in life.

In 1931 Evans registered for the pre-engineering course at a large state university. He was discouraged by the university authorities on the basis of his bad high-school record, but explained that he had not really tried very hard in high school. During his first semester at college he studied rhetoric, advanced algebra, physics, and German. He liked the laboratory work in physics. He and his partner managed very nicely by having Evans do the experiments which the partner wrote up for both of them. The lecture and reading quizzes were too much, and Evans failed the course. The course in algebra was even harder, a fact which was very discouraging because of the importance of mathematics in engineering work. Rhetoric was the hardest subject of all. In German he was lucky in that his room-mate spoke German and consented to coach him free of charge.

Evans received a barely passing mark in German and failed all the other three subjects. He was dismissed for low scholarship at the end of his first semester. Evans had liked the R.O.T.C. work and thought for a time that he might join the army, but did nothing about it as somebody told him that the army was overcrowded owing to the depression.

Soon after his dismissal from the university, Evans got a job in a garage and quickly learned the trade of automobile mechanic by watching and helping the regular mechanic when he was not busy washing cars and sweeping out. Last year he was given a job as a regular mechanic and has been making good. He married soon after that. He sometimes dreams of completing his engineering training but realizes that a family man is not free to do just as he pleases—especially since they are expecting a baby.

Evans likes to go to baseball games or to listen to them over the radio. He is fond of Amos and Andy programs and likes to read the comic strips. He takes his wife to the movies about once a week. She would like to go to dances, but he thinks that is kid stuff.

When asked as a part of a standardized test procedure to give the difference between idleness and laziness, he was unable to do so. When asked what is the difference between evolution and revolution, he replied: "Evolution is a theory. The earth makes one revolution in a day. That's why we have day and night. The sun stays still but the earth turns." His score on another test of intelligence was equal to that of the average fourteen-year-old child.

### *Eugene Hoskins, an extreme case of uneven development<sup>2</sup>*

Eugene Hoskins, though feeble-minded, had one strength. He lives at Oxford, Miss., a University place of about three thousand people. He is well known about town for his eccentricities, but more especially for his uncanny knowledge of dates. A bystander said to him: "I was married on the 8th of June, 1901." Without a moment's hesitation Eugene said: "Dat was Satu'day." Given the month, day, and year, he will give the day of the week. He never fails, never hesitates. Vary it if you will by giving the year and month and asking what day of the month was the second Tuesday, or the fourth Friday—he answers just the same. It is one of the diversions among the university students to get old calendars and try him out. He is a never-ending source of entertainment for them.

I have said he never fails. That is, so long as you stay within his limits. Go beyond that and he is at sea. He can't go back beyond 1901, and can't go forward beyond 1924. But during these 24 years success is 100%. It should be noted, however, that his limits have not always been so advanced. Mr. Harvey remembers when he could not go beyond 1920, and

Eugene himself admitted to me that he is advancing his limits and hopes to reach 1925 by next year. Asked how he does it, Eugene says he can't tell you—that he doesn't know himself. So the impression has gone forth that it is a sort of supernatural gift.

Eugene says he was born in Tate County, Miss., September 10, 1896, which is probably correct—one can almost imagine that he remembers it. He is rather tall, regular build, and quite black—the type that is known in the race as “eight-rock.”

He has a habit of shrugging his—I started to say his shoulders, but I believe it is his whole back that he shrugs. It certainly gives that impression. He also has a habit of mumbling to himself, and often laughs right out.

The first time he ever went through his paces for me he held out his hand for money. I gave him a dime which he accepted, but he will rarely accept more than a nickel. He has been known to refuse a dollar and become indignant when the donor put it in his pocket. He would not touch it and insisted that it be taken out. He is fond of music and keeps a guitar, but he can only thrum. He used to beg one of the students in the University (Mr. Harvey) who plays a violin to play with him. I lately arranged with Mr. Harvey to do so, and proposed it to Gene, but he assured me he could not play, and would not engage to try. He stays with the Gambles, who furnish him food and clothes and a place to sleep, in return for which he delivers papers, gets in coal, feeds the pigs on the farm, and does little odds and ends about the place. He trusts the Gambles implicitly, but buys his own sugar for his coffee. He is variously called Eugene, Gene, James, and Jim. He resents being called Jim and will not answer to it. When the grass was burning and was about to reach the Rogers house, someone called out to “Jim” to bring a pail of water. But he balked and refused to move. When asked about it later he said: “Da wan't talking to me—I ain't Jim.” But when Mr. Gamble calls him Jim it amuses him—he takes no exception to it. He meets all trains that pass in the daytime and in the early part of the night. It is said that he meets them all. I had occasion to leave recently on a train between three and four o'clock in the morning. He was there to meet that train, although it was a very chilly morning. I was talking with him once at the Gambles, questioning him about himself and family, when the locomotive whistled. He darted out of the room almost like a released spring. I asked him yesterday if he meets all trains. He said not, and told me of two or three times that the trains had passed when he didn't meet them. He has never been to school “to speak of” but keeps a pencil and a note-book in which he prints out words. He spells out all the words he sees. In my office while taking the Binet test he stopped to spell out the word *globe* on a card index case.

It is of great significance in understanding the case of Eugene Hoskins to note that he failed the following test which is passed by the average child of three and a half: "Now I want you to do something for me. Here's a key. I want you to put it on that chair over there; then I want you to shut that door, and then bring me the box which you see over there" (the examiner points in turn to the objects designated). "Do you understand? Be sure to get it right. First, put the key on the chair, then shut the door, then bring me the box" (the examiner points again to the objects in turn). "Go ahead."<sup>3</sup> How does it come about that Eugene, who astounded people with his good "memory," was unable to remember three simple commissions in the test?

Careful study of Eugene and his methods showed that part of the secret of his success lay in hard work. His general intelligence was limited, but he gave his all to memorizing dates. He kept a note-book and reviewed frequently. His intense interest in memorizing dates plus an unusually high special capacity for that performance combined to make him excel, in this one thing, people of average intelligence.

Such extremely uneven development is not limited to feeble-minded individuals but is also to be found in the average and superior levels. Finklestein, for example, is of high general intelligence, with a very superior ability in remembering and manipulating numbers.

### *Little Abbie, a case of feeble-mindedness<sup>4</sup>*

Admitted to the New Jersey Training School for Feeble-Minded Boys and Girls in 1900, at the age of eleven. Abbie was small for her age, left-handed, and awkward. She always put the *same foot* forward when going up or down stairs; she knew her letters but could not read; she could count to ten; she knew some color and form; and she sang a number of hymns that she had learned at home. Her sight and hearing were normal, and she was fond of play. Among Abbie's more unfavorable characteristics were a bad memory and a poor power of imitation. She was gluttonous, untidy, untruthful, sly, and profane.

Three months after her admission she could thread a needle and sew on buttons, could dust and rub floors a little, had learned to read *A man ran* and *I see a man* (sometimes), count to twenty, and, with help, could do such number work as this:

$$\begin{array}{ccc} 1 & 2 & 3 \\ +1 & +1 & +1 \end{array}$$

For ten years she went to school. For ten years her teachers struggled heroically to give her the mastery of *something*. Little less than marvelous is the optimism and faithfulness of those teachers! We see them struggling on month after month, not in that perfunctory way born of discouragement or conscious failure, but with that courage and cheerfulness which comes from grasping at every straw of encouragement, of progress, of fancied improvement. Had these teachers become discouraged, we would have to admit that perhaps the result might be due to that fact. But there is no sign of giving up in all these years. Within the last few months, however, there has appeared the feeling that Abbie has reached her limit. She will be twenty-two years old before long.

Today she is still small for her age. She can braid corn-husks a little; can make a bed; can iron an apron; cannot count the cost of three one-cent stamps and three two-cent stamps, with the stamps before her; cannot repeat five figures or a sentence of fifteen words; defines only in terms of use, "What is an apple?" "You eat it." Can read a few sentences, spell a few words and write about twenty-five words from memory; knows the days of the week, but not the months of the year; and does not know how many fingers she has on both hands.

Thus lived Abbie, little in body, less in mind, forever a burden on society.

### *Feeble-Mindedness As a Social Problem*

WE ARE LIVING in an age which makes heavy demands upon human intelligence. Our society is ever becoming more and more complex; ever demanding greater and greater intelligence for its successful direction. The intense competition of present-day life seems to be causing a stratification of people into socio-economic levels determined in a significant degree by native intelligence. Some people are so unintelligent as to be completely unable to live by their own efforts in our complicated social group. In the last analysis feeble-mindedness is defined socially. If an individual is unable to take care of himself in conformity with our economic standards and our social mores, he is called feeble-minded. Such persons have to be cared for at the expense of the state in which they live; for we have found that, expensive as such care is, it is far more costly to let them circulate freely outside institution walls.

The social problem of the feeble-minded was not so serious in the days of the Greeks and Romans, for the difficult life and vigorous warfare of those times served to weed out the defective and socially incompetent. The practice of infant exposure, although directed at the elimination of the physical weakling, served also to eliminate many of the feeble-minded. Poor physical stamina and low intelligence go together more often than not. Moreover, the warfare of the ancients was of such a nature as to place a premium on individual alertness and cunning. In hand-to-hand fighting there were but two possibilities, to be alert or to be dead. The term *imbecile* originally meant "unfit for war."

During the medieval period of history the fortunes of the feeble-minded took an upward turn. The rise of Christianity with its emphasis on mercy and charity brought about a decided change in the treatment of mental defectives. These individuals were regarded during this period as possessing wisdom of the ways of God which far surpassed those of the normal individual. The prattlings of the "fool" were taken as revelations from the Deity. The feeble-minded were far better cared for than the poor of normal intelligence. In France today there are still institutions for the feeble-minded which bear the inscription: "*Maison des Enfants du bon Dieu.*" Literally translated this means, Home for the Good Lord's Children. In Ireland the feeble-minded are still sometimes referred to as "the innocents."

The rise of Protestantism brought a sweeping change in the attitude of people toward the mentally defective. No longer "children of the Lord" the unfortunates became children of the Devil. They were thrown into dungeons, chained, and beaten in a manner thoroughly consistent with the notion of man's innate sinfulness and the doctrine of free will.

Obviously, neither of the two attitudes described here was adequate or intelligent. The feeble-minded are neither to be pampered nor punished. They must be dealt with in a humane but effective manner in the interests of the great bulk of the productive members of society. They must be trained to use such capacities as they possess.

The coming of the industrial revolution and the consequent rise of factory work served to bring the problem of the feeble-



minged into sharp focus. Factory owners in those days frequently contracted with the city fathers of a particular community to take over all the orphans and homeless children. In return for the food and clothing furnished them by their employer, the latter was entitled to the children's services as factory workers. It was found that the decidedly feeble-minded could not learn the mysteries of the factory machinery, and the owners tried to select the normal and leave the inferior on the hands of the community. There are records of actual agreements between the employer and the town, in which the former agreed to take one idiot in every group of twenty children bound out.

In the town of Halle, Germany, in the middle of the nineteenth century, attempts were made to shame the laggards in the schools by placing them in special classes. The modern idea of putting the slow in special sections for special instruction was not involved. The educators thought that the only important source of slowness in learning was lack of interest. They thought that the segregated children would be so ashamed of the "dunce" room that they would strive hard to escape its disgrace. Perhaps they did try harder. In any case they did not catch up with their erstwhile classmates. Instead they fell further and further behind as time went on. The reason in most cases was their lack of intelligence.

By the beginning of the twentieth century the problem of the feeble-minded in the Paris schools had become very acute. Certain children were failing completely to respond to the efforts of their teachers. Such children served to hold back the progress of the brighter ones. It was to meet this problem that the first tests of intelligence were developed.

### *The Development of Intelligence Tests*

IN THE YEAR 1904 the Minister of Public Instruction of France formed a commission of medical men, educators, scientists, and public officials to inquire into the pressing problem of the feeble-minded children in the public schools. There was a great deal of talk by the pompous members of the commission, but the important work was done by Binet, a young scholar of the young science of psychology, and Simon, an elderly physician.

### *The Binet tests of general intelligence*

Binet prepared a test of intelligence which was tried out in 1905. His test contained problem situations which were selected with extreme care and were accurately scorable; they were varied in nature, little influenced by the type of environment in which the child lived, and stressed judgment and reasoning rather than mere rote memory.

*The concept of the M.A.* Binet expressed the results of his tests on feeble-minded children in terms of the age at which normal children could make the equivalent score. For example, if a particular defective earned a score on the test which was earned by the average child of five years, the feeble-minded child was said to have a *mental age* (M.A.) of five years. This method of defining the unit of intelligence was so convenient that Binet later arranged his various tests in mental age levels.

Binet's extensive use of intelligence tests showed conclusively that feeble-mindedness exists in an infinite series of degrees. There are no real lines of demarcation setting off one intelligence group from another. You saw in Chapter 12 that the feeble-minded are not a distinct class, although the idiot and the genius are so far removed in their abilities that they seem to be different in kind. The very bright and the very dull are simply extremes in a continuous distribution.

*Mental retardation increases with age.* At first Binet made no attempt to state *why* a child was feeble-minded or to predict a child's mental status at a future date. He was content to describe the child's mental status at the time of testing. As the results obtained from use of the Binet tests accumulated and as more and more children were tested and retested at later dates, it was seen that the child who was, for example, two years retarded at an early age would be still more retarded at a later age.

*Binet's final scale (1911).* The tentative scale of 1905 passed through a process of revision and standardization and finally culminated in 1911 in the following set of standards arranged at the age levels indicated.<sup>5</sup> Needless to say, the reader would get a much better picture of the Binet scale if the various materials employed were at hand to examine. Lacking this, a general idea of

the procedure may be obtained from a study of this list of items. The best understanding of what an intelligence test is would be obtained by examining one which is in everyday use at the present time. The professional ethics of the psychologist do not permit the publishing of intelligence test items, as this practice would tend to lower the validity of such test items through permitting people to practice on them.

## AGE 3

1. Points to nose, eyes, and mouth.
2. Repeats sentences of six syllables.
3. Repeats two digits.
4. Enumerates objects in pictures.
5. Gives his family name.

## AGE 4

1. Gives own sex.
2. Names familiar objects.
3. Repeats three digits.
4. Tells which of two lines is longer.

## AGE 5

1. Compares two boxes of different weight.
2. Copies a square.
3. Fits together the two parts of a rectangular card cut diagonally to match a similar uncut card placed before him.
4. Counts four coins.
5. Repeats a sentence of ten syllables.

## AGE 6

1. Tells whether it is morning or afternoon.
2. Defines words in terms of use, as: ORANGE, "you eat it."
3. Copies a diamond.
4. Counts thirteen coins.
5. Points out the prettier of each of two pairs of human faces.

## AGE 7

1. Shows right hand and left ear.
2. Describes pictures.
3. Executes three commissions.
4. Counts the value of three single and three double *sous*.
5. Names four colors—red, green, blue, and yellow.

## AGE 8

1. Gives difference between two objects from memory.
2. Counts backwards from 20 to 0.
3. Notes what is lacking in a picture.
4. Gives a date.
5. Repeats five digits.

## AGE 9

1. Gives change for twenty *sous*.
2. Defines familiar word in terms superior to use, i.e., shows how it is related to other ideas.
3. Recognizes value of nine pieces of money.
4. Gives the names of the months in order.
5. Comprehends easy common-sense questions.

## AGE 10

1. Arranges five boxes in order of weight.
2. Copies two designs from memory.
3. Criticizes absurd statements.
4. Comprehends difficult common-sense questions.
5. Uses three given words in not more than two sentences.

## AGE 12

1. Resists suggestion as to length of lines.
2. Uses three given words in one sentence.
3. Gives sixty words in three minutes.
4. Defines three abstract words.
5. Puts scrambled words into meaningful sentence.

## AGE 15

1. Repeats seven digits.
2. Finds three rimes for a given word.
3. Repeats a sentence of 26 syllables.
4. Interprets action in pictures.
5. Interprets given facts.

## AGE ADULT

1. Tells how a paper which has been folded and cut will look when smoothed out flat.
2. Rearranges two triangles in imagination and draws result.
3. Gives three differences between a president and a king.
4. Gives differences between pairs of abstract words.
5. Gives the sense of a passage which has been read to him.

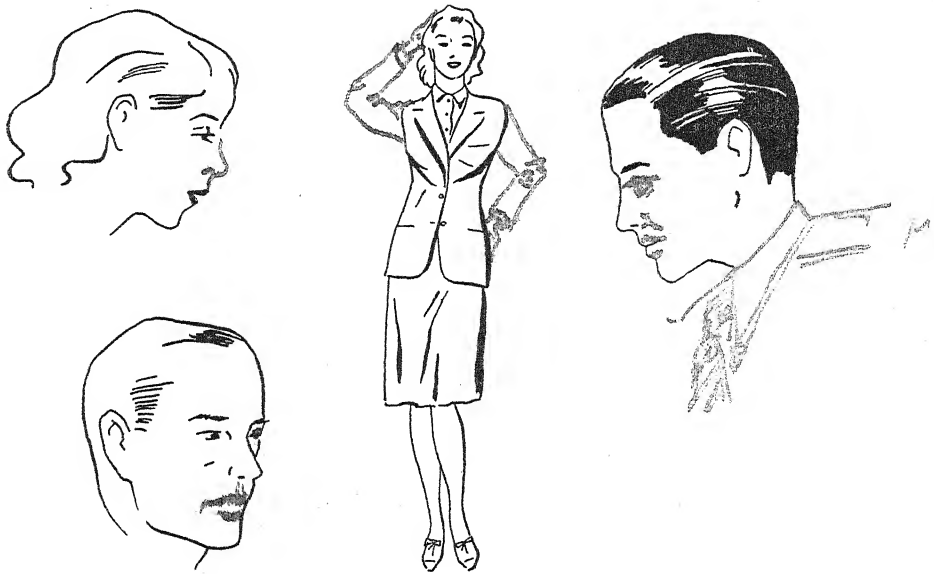


FIGURE 67. *Acuteness begins by six. An average child of six years can tell what is wrong with three of these four pictures. (Adapted from the Stanford-Binet scale of 1916.)*

### *The Stanford revisions*

Terman, a psychologist at Stanford University, tried out on about 1000 children the materials which Binet had used, along with others gathered from various sources or invented by himself. With much painstaking effort he arranged the tests into mental age levels and evolved in 1916 the Stanford Revision of the Binet Tests, which remained twenty years a standard instrument in clinical psychology, psychiatry, and educational counseling.<sup>6</sup> These items cannot be reproduced in detail for fear of destroying the value of the items for testing. They are similar to the ones from the original Binet scale listed above.

In 1937 Terman and Merrill published a new revision of the Binet tests.<sup>7</sup> In the course of twenty years of use, certain defects and limitations in the Terman scale had become apparent. Especially glaring were the following: (1) it was not applicable to adults; the tests were too easy, especially for the superior adults, and the scoring for adults was incomplete and gave misleading ratings; (2) it did not provide adequately standardized tests for

very young children; (3) it existed in one form only. This latter limitation was particularly serious. There are many times when a psychologist questions the reliability of a given rating because of unsatisfactory testing conditions or because it does not seem to be consistent with other findings. At such times an alternative form (one which is similar in nature but differs in specific content) is of great value, since a child cannot be tested at too close intervals with the same form of test, as familiarity with the problems would invalidate the results.

The 1937 revision was standardized on more than 3000 cases and was aimed at correcting the difficulties or defects of the former scale. The scale now contains two forms of equal difficulty and of comparable material; provision is made for the testing of children as young as two years of age, and the test has been extended at the upper limit also, to permit differentiation of adults of superior intelligence. At the lower mental age levels, where mental growth is very rapid, sets of tests are provided at half-yearly intervals instead of at yearly intervals as is the case above 5 years.

### *Performance tests*

The Stanford-Binet test is probably the most widely used of the intelligence tests because it correlates so highly with grades in school and hence is invaluable in predicting a child's school progress and planning his curriculum and promotions accordingly. However, although it contains items measuring numerical and relational intelligence (p. 458), it is predominantly a test of verbal intelligence. Thus in the case of a deaf child or one of foreign parents where English is not spoken in the home, the Stanford-Binet often does not give a fair indication of actual intellectual ability.

Therefore it has been necessary to develop certain other types of tests, most common of which is the performance test where the individual being tested is not required to use language at all. Ideally, even the instructions are given without the use of language. This is true of the Pintner-Paterson Performance Scale in which directions may be given by means of pantomime and demonstration.<sup>8</sup> Tests include such tasks as form boards (boards with recesses in which blocks of the proper size and shape must be selected as

quickly as the individual is able to do so), picture-completion tests (in which the individual gathers from the context of the rest of a picture which one of several pictured items will fill in the blank and make the best, most sensible picture), and imitation of experimenter's tapping of four small cubes in particular orders. From the scores obtained in performance tests it is possible to derive mental age and I.Q.

### *The Concept of the I.Q.*

AS HAS ALREADY been stated, the earlier workers in the field of intelligence testing had noticed that the amount of mental retardation as measured in mental age units increases as the child becomes older chronologically. If a child has a mental age of 4 when he is 5, his mental age will be only 8 when he is 10. Thus, though the total amount of retardation increases, the mental age and chronological age maintain the same relation to each other. A German psychologist, Stern, suggested that the relationship between chronological age and mental age is such that the latter divided by the former would give a figure for any given individual that would remain more or less constant over a period of years, thus making possible the comparison of individuals of differing ages.<sup>9</sup> This concept, which we call Intelligence Quotient (I.Q.), was adopted by Terman for use in the Stanford revisions.

#### *Computing the I. Q.*

The formula for the I.Q. is very easily written:

$$\text{I.Q.} = \frac{\text{M.A.}}{\text{C.A.}} (100).$$

Translated into everyday language, this means: divide the mental age (as obtained by the tests) by the chronological, or real, age of the subject and multiply by a hundred. The multiplication serves to eliminate fractions and decimals, making I.Q.'s expressible as whole numbers.

Let us take an example of the calculation of the I.Q. William is 10 years and 2 months of age to the nearest month, and his mental age is 12 years and 2 months. What is his I.Q.? First we change his mental age into months. This gives us 146. Chrono-



logical age, also converted into months, gives us 122. The next step is simple division. 146 divided by 122 equals 1.19. We eliminate the decimal point by multiplying by 100. The resulting figure of 119 is the boy's I.Q.

In the case of a child of average intelligence, mental age and chronological age are the same, making  $\frac{M.A.}{C.A.} = 1$  and  $I.Q. = 100$ .

If the mental age is greater than the chronological age, the individual is of above average intelligence; the top of the fraction will be bigger than the bottom, as in the case of William described above;  $\frac{M.A.}{C.A.}$  will be more than 1 and the I.Q. will be more than 100. In the case of a below average child the M.A. will be less than his C.A., and  $\frac{M.A.}{C.A.}$  will be less than 1, and the I.Q. will be less than 100.

As previously indicated, it was possible on the 1916 Binet scale to obtain somewhat questionable mental ages for adults. However, no valid means were provided for the computing of I.Q.'s for adults. The relation of M.A. to C.A. is constant up to the age of 13. We saw on the preceding page that if a child has an M.A. of 4 at the age of 5 he will have an M.A. of 8 when he is 10. But after the age of 13 mental age increases much more slowly until at about the age of 16 it levels off and remains about the same. This means that the divisor (C.A.) must be "corrected" in order to obtain an I.Q. comparable to those obtained at earlier ages. Since the figuring of this "correction" is rather complicated to go through every time the test is given, Terman and Merrill have in their 1937 edition provided a table for the finding of I.Q.'s, in which the ratings at the upper levels have been already corrected; all you need to know is the M.A. and actual C.A.

### *What does a given I. Q. mean?*

Trained psychologists, as well as teachers and physicians dealing with problem cases, have associated certain I.Q. values with certain general pictures of adaptive behavior. For the beginning student who has not had this practical experience, the numbers mean little. Even if they are told that a man's I.Q. is 15, they can have no clear picture of what such an individual can and cannot do.

*How I.Q.'s are distributed among the population.* One way in which the beginning student in psychology can get some impression of the meaning of the various I.Q.'s is to consult the frequency distribution shown in Table 37. Remember that the mean I.Q. is 100. Half of the people fall below 100 I.Q., and the other half come above it.

You will notice from the table how heavily the cases are concentrated around the center. Almost 70% of the population falls between 84 and 116, leaving only about 15% beyond these limits in both directions; I.Q.'s of from 90 to 109 are classified as "average."

TABLE 37: *Distribution of I.Q.'s in the General Population* (as based on the 1937 revision of the Stanford-Binet tests)

| I.Q. RANGE | PERCENTAGE OF<br>POPULATION INCLUDED |
|------------|--------------------------------------|
| Below 68   | 2                                    |
| 68 to 83   | 14                                   |
| 84 to 116  | 68                                   |
| 117 to 132 | 14                                   |
| Above 132  | 2                                    |

The feeble-minded, about 2% of the population, are roughly classed into three grades. The lowest form of feeble-mindedness, idiocy, has an I.Q. range from 0 to 25; the next grade, imbecility, from 26 to 50; the highest grade of feeble-mindedness, morosity, from 51 to 70. In the 70's there is a band of doubt where some individuals are feeble-minded, and others are not. In the final analysis, as we have already seen, the definition of feeble-mindedness is a social one. People who are not capable because of low intelligence of conducting their worldly affairs without supervision are feeble-minded. The exact intellectual level below which an individual cannot shift for himself will depend upon the complexity of his environment and the problems of adjustment that it presents, as well as upon the training he has received. One individual with an I.Q. of 70 who has been taken care of and pampered all his life may be feeble-minded, while another who has grown up having to fend for himself and earn his own living may not be feeble-minded.

Nor are the boundary lines between the various grades of

feeble-mindedness hard and fast. Just as the feeble-minded as a whole are not a class distinct and apart from the normal people, so also the three classes of feeble-minded are not actually distinct from each other. Each shades imperceptibly into the next, and the I.Q. limits quoted are no more than a rough attempt at classification.

*Prediction of future success.* The most significant and dramatic demonstration of the meaning of high I.Q. is still under way but can be read through the second act at least.

For nearly twenty years Terman has been following the fortunes of 1,300 individuals representing the cream of the crop of some 250,000 California school children tested in 1922. Each of these subjects was the brightest boy or girl in a group of 192. Each of them had an I.Q. of 140 or more; the mean I.Q. for the group was 150.<sup>10</sup>

In 1940, a follow-up survey was conducted to see how well these individuals have succeeded in life. These results leave little doubt that the intelligence test measures something vitally important to successful living. Here are the facts:

1. The death rate is much lower than that of the central group. This lays forever the old notion that bright children are sickly and that a strong back goes with a weak mind.
2. The insanity and suicide rates are lower than that of the general population. This disproves the legend that "genius is akin to insanity."
3. The divorce rate of the gifted group is lower than that for the state of California as a whole.
4. Ninety per cent of the gifted group entered college; of these about 93% graduated. This showing is about forty times higher than the standard for the country as a whole. Their college grades and honors were higher than those of the average college student.
5. The gifted were far more active in student-body affairs as shown by election to office and activity point scores.
6. The earnings of the gifted group far excel those of the general public of the same age. Not one of the group was on the relief rolls even though many finished their schooling and were just starting in life when the depression hit.

At age thirty, the average earned income was \$250 a month. A dozen of the men (or 2% of the group) earned more than \$10,000 per year. Only 1/10% of the general population achieves such high earnings.

The children of the gifted are outstandingly gifted. The mean I.Q. of the 300 offspring tested was 127. This is about what the laws of heredity would lead one to expect if intelligence is an inherited trait. The gifted parents, of course, usually married individuals of lower intelligence than themselves. This would account in part for the lower, but still high, I.Q.'s of the children.

This array of facts leaves little doubt that the I.Q. measures something in the individual that makes for success in life.

*Meaning of I.Q.'s in terms of general behavior.* Another way of getting acquainted with the meaning of I.Q.'s is to see how people of different I.Q.'s behave and what they can do.

Idiots (I.Q. 0 to I.Q. 25) never learn to avoid the common dangers of life. They would soon die if not cared for by others. Many of them never learn to dress themselves or to say even a few simple words. Some never learn to sit up, and remain in bed all of their lives. If you can imagine a human adult with the intellectual capacity of an average two-year-old baby, you have a good picture of the human idiot.

Imbeciles (I.Q. 26 to I.Q. 50) learn to talk a little. They can even learn to do simple work, such as ditch-digging and mopping the floor, under close supervision. They are not able to understand the value of money and cannot be permitted to live outside of an institution or away from the close supervision of their family. The imbecile attains a mental ability ranging from that of an average three-year-old to that of an average seven-year-old child.

Morons (I.Q. 51 to I.Q. 70) can learn to read and write and can perform certain types of routine factory work. They cannot be expected to go beyond the fourth or fifth grade in school. If left to their own devices they usually run afoul of the law, for they are incapable of recognizing the moral obligation to repay debts or to settle for goods bought on credit at a store. Adult morons have normal drives and emotions but lack the capacity of the more intelligent person to foresee the consequences of their emotional behavior. The frequency of illegitimate motherhood is highest among moron girls. Professional "toughs," petty thieves, and prostitutes are recruited largely from the moron class and the borderline cases in the I.Q. 70 band. As adults, morons have the intellectual capacity of average children aged from seven to ten years.

You will recall the case of little Abbie, given on pages 480 and 481. On the basis of the behavior described in the report, one would judge that her I.Q. must have been in the 40's, which would place her in the upper part of the imbecile group. According to this figuring her mental age when fully mature was about six years. Eugene Hoskins, the case of uneven development described, is another example of feeble-mindedness probably at about the same level as little Abbie.

Henry Evans was described as a case of average development (p. 477). There are many people like Henry Evans in the world. In this great group of average people we find many of the carpenters, the plumbers, the policemen, and the garage mechanics whose services are so essential. Such people can get through high school with difficulty. A few of them even try to go to college, but they are certain to fail unless they are coached by friends or professionals. Below them are the semi-skilled and unskilled laborers. Above the Henry Evanses, but not so high as Philippa, we find the competent business and professional men and women. The leaders in these groups are likely to be higher still in intelligence.

College graduates probably average close to 130 I.Q. In one large Midwestern state university the average I.Q. of all students enrolled is 115. College training requires intellectual ability well above average; thus only a relatively small per cent of the population can be expected to profit from higher education. This fact has definite implications for social planning. That higher education is available to only a small per cent of our youth is fair or unfair not on the basis of how many or how few get to go to college but on the basis of how students are selected—whether the available opportunities are given to those most able to profit from them.

In the next chapter we will see in greater detail how the population becomes stratified in the various occupations according to intelligence level. Table 45 on page 529 gives the I.Q. range typical in several representative occupations.

*Is the I.Q. constant when conditions remain the same?*

If the I.Q. remains constant, we will be able to predict the future mental status of an individual on the basis of a test of

intelligence made in childhood. The advantages of such predictions are obvious. Early in the child's life, the parents of a bright child can lay plans for his future without fear that their high ambitions will be thwarted. The parents of the child of average intelligence will be able to plan that child's occupational future accordingly and to guide him into some line of work in which his moderate intelligence will not predispose him to failure. In the case of the feeble-minded child, the authorities can act with great confidence in placing a boy or girl in an institution. Constancy of I.Q. would broaden tremendously the fields of human behavior where accurate prediction would be possible. That such prediction is one of the fundamental aims of science we have already seen.

Let us first examine the evidence with regard to the constancy of the I.Q. of children who are feeble-minded or of decidedly inferior intelligence. There have been many studies on this important problem, all of which are in essential agreement. Minogue studied the problem of the constancy of I.Q. in a group of 441 feeble-minded.<sup>11</sup> These cases were tested upon admission to an institution and were retested later at intervals of from two to ten years. If the I.Q. had not changed more than five points, it was regarded as constant. A change of five I.Q. points is not very significant when we consider that the lowest grade of idiot tests practically 0 and the highest I.Q. is at least 200. Differences of five points in an observed range of 200 must be regarded as remarkably small in the measurement of something as complex as intelligence. Often, too, such a small deviation cannot be regarded as a reliable difference. Table 38 shows Minogue's results in tabular form.

TABLE 38: *Constancy of the I.Q. of Mental Defectives*

| STATUS OF I.Q.                                     | NUMBER<br>OF CASES | PER CENT<br>OF ALL CASES<br>STUDIED |
|----------------------------------------------------|--------------------|-------------------------------------|
| Remained constant (5 points or less of difference) | 316                | 71.7                                |
| Gained (more than 5 points difference)*            | 21                 | 4.8                                 |
| Lost (more than 5 points difference)†              | 104                | 23.6                                |

\*Case of greatest gain, 21 points.

†Case of greatest loss, 23 points.

Notice that the feeble-minded children showed losses more often than gains after a period of several years in the institution. Although most of the changes were slight, they indicate that the institutional life is slightly less effective in developing intelligence than was the home life of the children prior to their admission to the institution.

Cattell analyzed the changes of I.Q. of 1183 individuals of I.Q. 80 upwards to very superior, retested at variable intervals up to six years.<sup>12</sup> As you will see in Table 39, various groups of her total population showed average differences between the testings ranging from 0.1 to 5.0 I.Q. points, according to the length of time elapsing between tests. The average difference of 5 I.Q. points occurred in groups repeating the test within 3 months and was evidently largely due to a practice effect on specific test items; the average difference of 0.1 point occurred in groups where 60 to 72

TABLE 39: *Average Constancy of the I.Q.'s of a Typical Group*

| MONTHS<br>BETWEEN TESTS | MEDIAN DIFFERENCE<br>IN I.Q. POINTS |
|-------------------------|-------------------------------------|
| 0-3                     | +5.0                                |
| 3-6                     | +3.8                                |
| 6-12                    | +0.2                                |
| 12-18                   | +2.0                                |
| 18-24                   | -0.5                                |
| 24-36                   | -0.2                                |
| 36-48                   | -2.7                                |
| 48-60                   | +1.0                                |
| 60-72                   | -0.1                                |

months elapsed between tests. The superior children gained slightly while the duller children lost in I.Q. between tests.

The results reviewed here are typical of those obtained by more than a dozen studies based on thousands of subjects and give one no hope that early feeble-mindedness is something which a child will "outgrow."

The most recent and most convincing demonstration of the constancy of intelligence as measured by the Stanford-Binet tests is reported in another aspect of Terman's study of gifted children. In 1922, at the time of the first testing, the group was in the upper one-half per cent of the total population. Six years later, and again



eighteen years later, tests suitable to adults showed a majority of the subjects in or close to the upper one per cent of the general population. This finding leaves little credence to the popular belief that bright youngsters "burn out" mentally and become even feeble-minded.

*Is the I.Q. constant under changing conditions?*

There are two fundamental hypotheses which will account for the observed high degree of constancy of the I.Q. First hypothesis: The I.Q. depends upon the quality of the environment in which the individual lives and will remain constant as long as his environment remains of unaltered quality. Second hypothesis: The I.Q. depends upon the heredity of the individual and is constant because the heredity of the individual is predetermined and does not change. The answer to this question of the exact rôles played by these two factors is necessarily somewhat involved, but its importance in social living is so great that we are more than justified in inquiring into it. After all, if we are to improve the intelligence of the human race, we must understand the factors which guide its development. Let us examine the evidence.

The cloud of controversy which often befalls the study of the relative effects of heredity and environment on human behavior grows out of a failure to define the issue—or, more properly, to define the issues. It is quite impossible to state in a general way that human behavior depends more on environment than on heredity or that it depends more on heredity than upon environment. There are many issues and an equal number of answers, different for different traits. The balance of power will be one way for the trait of intelligence, quite different for a particular trait of personality, still different for a trait of morality. In this section we shall find a fairly definite answer to the question as to the trait of intelligence and more specifically as to the trait of intelligence as defined by the Stanford-Binet tests. Since we are trying to determine the effect of each of two variables, our attempts can be successful only as we hold one of them constant while the other varies.

The best way to hold hereditary factors constant while varying environment is to use a large number of identical twins, the mem-

bers of each pair being separated at birth and sent into foster homes ranging in quality from the poorest to the best. The quality of the homes into which the members of each twin pair would be sent would be determined purely by chance so that the quality of the environments of the identical twins would not be correlated. After an interval of years had elapsed, these twins would be subjected to many sorts of psychological tests and measurements. The scores of the members of each set of twins would then be correlated, and the answers to our various questions would be read in the size of the correlation coefficients expressing the degree of similarity between the members of the twin pairs. The heredity of identical twins is identical, i.e., constant from one to the other. The only variable condition would be that of environment. Therefore, any differences between the pairs would have to be attributed to environmental influences. As yet no scientifically minded dictator has appeared who would cause identical twins to be separated. But we have evidence which we will examine from a few cases of identical twins who were adopted into different foster homes and reared apart.

To vary heredity, holding environment constant, would involve bringing children of different hereditary backgrounds into the same foster home or institution. If they became more similar in the interval following, we would say the effect was due to environment; if no change was observed, the greater power of heredity would be shown.

Heredity the same, environment different. What happens when twins are separated and brought up under differing conditions, or when any individual or group changes from one type of environment to another?

A. Identical twins reared apart. Newman, Freeman, and Holzinger present life data on nineteen pairs of identical twins reared apart.<sup>13</sup>

(1) Ed and Fred (environment similar; resulting I.Q. the same).

Ed and Fred were separated in early infancy and lived in ignorance of each other's existence until 25 years of age, adopted by two different families, both living in the same New England town. The two families were of essentially the same social and economic status, both childless. The boys

were led to understand that they were the foster parents' real children. The boys even went to the same school for a time, but never knew that they were twin brothers. They were not close companions. When the twins were about eight years old, their families were permanently separated and the boys did not meet again until they were twenty-five years old. Though separated all these years, these twins led remarkably parallel lives. Both have been electricians for telephone companies, both married at the same time, the wives being of similar types, and each has a four-year-old son and a fox terrier named Trixie.

Both had some High School education, Edwin completing one year and Fred three years. There was no marked difference in their social environment.

At the time of testing there was one point difference in I.Q., one receiving an I.Q. of 90, the other 91.

(2) James and Reece (environment different; resulting I.Q. different).

Twins James and Reece were born in a mountain village of Tennessee. Their mother died in childbirth, and the father remarried when the twins were less than a year old, at which time they were taken by their grandparents. James went to the maternal and Reece to the paternal side of the family. Because of strained relations between the two foster-families the twins never associated. James's grandparents were of steady, industrious character living in a small town where the grandfather successfully operated a saw mill. The family was considered quite well-to-do in its small community. James is greatly interested in machinery and has been steadily employed since his graduation from high school. He is married and may be characterized as a steady, reliable person.

The paternal grandparents were mountaineers of the more primitive "hill billy" sort. The grandfather had never worked steadily, since his Civil War pension was almost enough for the family to live on. Reece followed the family custom of avoiding work. He attended a mountain school when he felt so inclined, but never for more than five months of the year. He continued, however, through the eighth grade. For a short time he worked in an automobile factory, but this was "too much like slavery" to him, so he returned to the mountains. His social environment was, naturally, in great contrast to that of his twin brother.

The twins are now very similar physically, but in intellectual ability they differ to an extreme degree, the difference in their I.Q. amounting to about 19 points. Reece's I.Q. is 77 and James's 96.

(3) The case of Mabel and Mary (similar environment; resulting I.Q. different).

These identical twin girls lived within a hundred miles of each other and were in constant communication. Mabel had lived on a farm since her adoption and had enjoyed it; Mary had lived on a farm for the first six years following her adoption and then moved permanently to a small town. The farm girl, Mabel, had measles twice, once in babyhood and again at age eighteen; had whooping cough at six; had rarely been troubled by colds or influenza. Mary, the town girl, also had measles twice during early school age, whooping cough before entering school, and influenza almost every winter. The climatic conditions were the same for both girls, although risk of exposure to influenza is greater in the town than in the country. Mabel completed only six weeks of high school, but Mary finished the full four years. Conditions in the homes were very similar. These girls showed a difference of 18 I.Q. points when tested. On the International Group Test, which is largely non-verbal and is little affected by differences in language training, the difference between the two girls was decidedly less.

(4) Richard and Raymond (environment different; resulting I.Q. the same).

These two identical twin boys were separated at the age of one month. After separation they entered homes of distinctly different environments, had about the same amount of schooling, and had contacts with one another at about yearly intervals. Richard was adopted by an uneducated truck farmer in southern Illinois. His life was not easy. He lived a hardy life and was forced to make frequent adaptation to changing environment. The family moved frequently, but Richard had an excellent foster mother. There were no foster brothers or sisters in the family. Raymond was adopted into the family of a prosperous physician in a large city in Indiana. Raymond had the advantage of a home life rich in cultural and material advantages.

Both had reached the eighth grade when tested. Their Stanford-Binet I.Q.'s differed by but one point. Richard, who had struggled for existence, was more aggressive in personality than the sheltered Raymond.

The study of the four typical case histories has no doubt convinced you that our problem is one presenting many combinations of social, material, and cultural environments. Under these circumstances it should be obvious that the final answer to the question of heredity *vs.* environment in determining intelligence will

depend upon the statistical analysis of the results of a large number of cases of identical twins reared apart. Although nineteen is an inadequate statistical population, it is still large enough to permit tentative analysis and conclusions. The average of the differences between the members of each of the nineteen twin pairs is 8.2 I.Q. points. The difference is only slightly larger than the average of the differences between two tests on the *same* individuals made at intervals of several years. The intelligence test scores of identical twins reared apart are almost as like as two scores on the same person and are nearly as like as those of identical twins reared together. Obviously identical heredity is a factor operating systematically to determine in a very real way the development of intelligence.

B. Putting the same individual in different environments. Thus far we have been discussing the effects of heredity and environment as they increased or minimized individual differences in I.Q. between two people. In such cases we have merely assumed heredity to be constant, since the subjects were identical twins. An even more conclusive test of the relative power of heredity and environment in determining intelligence would be to take one individual, subject him to various changes in environment, and see if his I.Q. changes accordingly.

Freeman observed the changes in I.Q. consequent to removal of children from an orphans' home to superior and to inferior environments.<sup>14</sup> A group of 74 children were included in this study. Their average residence in foster homes was four years. His results are summarized in Table 40.

TABLE 40: *Changes in I.Q.'s of Orphanage Children Removed to Superior and Inferior Foster Homes*

| GROUP                           | AVERAGE<br>AGE AT<br>1ST TEST | AVERAGE<br>AGE AT<br>2ND TEST | AVERAGE<br>I.Q. AT<br>1ST TEST | AVERAGE<br>I.Q. AT<br>2ND TEST | AVERAGE<br>CHANGE<br>IN I.Q. | NO. OF<br>CASES |
|---------------------------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|------------------------------|-----------------|
|                                 |                               |                               |                                |                                |                              |                 |
| Removed to<br>superior<br>homes | 7 yrs.,<br>8 mos.             | 11 yrs.,<br>11 mos.           | 95.2                           | 100.5                          | 5.3                          | 33              |
| Removed to<br>inferior<br>homes | 8 yrs.,<br>3 mos.             | 12 yrs.,<br>4 mos.            | 88.0                           | 88.1                           | 0.1                          | 41              |

Careful study of the above table shows that the difference be-

tween living in the poorer half of the homes as compared with the better was sufficient to account for a difference of five I.Q. points in the amounts gained by the two adopted groups. The table would seem to indicate that the poorer homes were no more stimulating to intelligence growth than was the environment of the orphans' home. The better homes brought some increase in I.Q. A slight correction must be introduced because the Stanford-Binet tests are a little too hard at the upper ages included in this study. Making this correction, we are safe in concluding that the effect of the difference between the better and the poorer homes was to raise the I.Q. about nine or ten points.

Another study by Skodak, of environmental influence on I.Q., gave results in line with those just reviewed. Children whose family backgrounds were inferior in intelligence, occupational level, educational achievement, and socio-economic status were placed in foster homes superior in these respects.<sup>15</sup> At the end of one year of residence in the foster home the I.Q.'s of the adopted children had increased on an average of 5.7 points; by the end of two years the average increase was 9.8 points.

Several valuable studies showing the effect of pre-school training on I.Q. have been conducted. Wellman studied the effect of participation in the activities of a pre-school upon the I.Q. level of a group of 600 children from decidedly superior homes.<sup>16</sup> Examination of her data shows that the stimulating environment of the pre-school was responsible for an average increase of about 15 I.Q. points. The group of children included in this study had an average I.Q. of about 112 upon entering the pre-school. Wellman points out the very significant fact that the greatest gains were made by those children whose I.Q.'s were lowest at the outset and the least gains by those who were highest initially. This situation is the reverse of that usually found in the learning of complex tasks, where the same training schedule usually widens individual differences, the initially superior individuals gaining more rapidly than the initially inferior. This pertinent observation leads us to inquire into the possible motives of upper-class parents in placing their children in a pre-school rather than assuming complete responsibility for the entire twenty-four hours of the child's day. In all probability certain superior parents felt that their business,

professional, or social duties were interfering with the adequate training of their children and were thereby moved to enroll them in the pre-school. In other words, it is possible that the *real* environment was not as adequate as the *apparent* environment presented by these upper-class homes; it is possible that the effective home environment in some cases was not adequate to permit the maximum development as established by maturational limits. In view of the data you have just reviewed, this interpretation seems to be valid.

Goodenough conducted a similar experiment in which twenty-eight children were measured before and after one year's experience in another pre-school of quality equal to the Iowa school.<sup>17</sup> She found average changes of I.Q. ranging from two to seven points for various age groups.

Barrett and Koch studied a group of twenty-seven children between the ages of thirty-five and sixty months.<sup>18</sup> These children, who were to enter the nursery school of an orphanage, were paired with others on the bases of sex, chronological age, intelligence, and institutional experience. The control group did not attend the nursery-school. The nursery-school group gained in I.Q. from an average 92 to an average of 113 over a period of nine months; the control group, from an average 93 to an average of 98. These results are in closer agreement with those of the Wellman than with those of the Goodenough study.

A three-year study was undertaken by Skeels, Updegraff, Wellman, and Williams to determine the effects of pre-school education under controlled conditions on the I.Q.'s of under-privileged children of average and below average intelligence.<sup>19</sup> The subjects were in residence at a soldiers' orphans' home, a state institution designed for the care of dependent and neglected children. Children of pre-school ages were divided into two groups matched on chronological age, mental age, I.Q., sex, nutritional status, and length of residence in the orphanage. The pre-school and control group experienced the same life and routine, except that the pre-school group spent several hours a day at the pre-school building. Approximately every six months all children were re-examined with the Stanford-Binet test. Three groupings of subjects were made according to the length of time spent in pre-school: 1 to 199



days, 200 to 399 days, and 400 or more days between tests. For the group as a whole there was no difference in trend between pre-school and control children during the shortest residence period of approximately four months. Subsequently, the pre-school and control groups began to diverge and the divergence became more marked as time went on. Over the longest period (approximately 20 months) the pre-school children gained 4.6 points in I.Q., while the control group lost 4.6 points. Thus in the end there was a difference in the I.Q.'s of the experimental and control groups of 9.2 I.Q. points.

These results are hard to interpret because we do not know exactly how much better the pre-school environment was than that of the institution, except that the pre-school was run by well-trained experts and was probably as good as our present knowledge and skill permits. The institution itself was probably as poor and unstimulating an environment as could be found in the twentieth century, in the United States.

In looking back, we see that the difference between good and bad environments can produce maximum differences of around 24 I.Q. points between experimental and control groups but that there is a wide variety in the differences actually found in the various studies, one showing differences as small as two points. Can the same differences be expected regardless of the age at which the environmental changes are made? Reymert and Hinton made an analysis of the case histories of 100 children who for four years were given the advantages of a good environment.<sup>20</sup> The age range at time of entrance was from three to fourteen years and the I.Q. range seventy to one hundred and thirty. Any advantageous effect on I.Q.'s obtained by transferring children from an inferior to a superior environment occurred when the change was made before the age of six.

We may conclude that the I.Q. can be changed to some extent by environment but still retains a high degree of constancy even when environment is markedly changed.

Environment the same, heredity varying.—In the preceding discussion we saw something of the restricted effect environment has in determining the I.Q.'s of individuals of constant heredity. In this section we shall examine the degree of potency of the environ-

ment to determine the intelligence of adopted children. In doing so we reason as follows: If the quality of the environment in a foster home correlates positively with the intelligence of the adopted children who have lived in it for a long time, and if the original correlation between the quality of the child's heredity and the quality of the foster home environment was zero, then we can conclude that the correlation observed is due to the effect of environment. In other words, if babies are adopted into foster homes of high or low quality regardless of the quality of the babies' heredity, the correlation between the quality of the home and the quality of the babies' heredity would be zero. If the correlation between the quality of the environment and the intelligence of the foster children increased after a period of residence in the foster home, that increase would be due to environment. Moreover, after making full allowance for the effect of environment on the intelligence, we can assign the remaining influence to heredity. The detailed solution of this problem involves a statistical technique which is quite beyond the understanding of the beginning student.

Burks obtained the following correlations with a group of foster children and with a control group made up of children living with their biological parents.<sup>21</sup>

TABLE 41: *Correlations between I.Q. of Child and Various Factors*  
(Burks)

| FACTOR                | CORRELA-<br>TION WITH      |                    | CORRELA-<br>TION WITH    |                    |
|-----------------------|----------------------------|--------------------|--------------------------|--------------------|
|                       | I.Q. OF<br>FOSTER<br>CHILD | NUMBER<br>OF CASES | I.Q. OF<br>REAL<br>CHILD | NUMBER<br>OF CASES |
| Father's M.A.         | .09                        | 178                | .55                      | 100                |
| Mother's M.A.         | .23                        | 204                | .57                      | 105                |
| Father's vocabulary   | .14                        | 181                | .52                      | 101                |
| Mother's vocabulary   | .25                        | 202                | .48                      | 104                |
| Culture index of home | .29                        | 186                | .49                      | 101                |
| Income                | .26                        | 181                | .26                      | 99                 |

Compare the correlations between foster parent and child with those of parent and real child. Notice that father's mental age, mother's mental age, father's vocabulary, and mother's vocabulary all correlate higher in the case of the real children than in the

case of the foster children. The higher correlation obtained with the real parent-child combinations grows out of the resemblance between them in both heredity and environment. In the case of the foster parent-child combinations, where environment alone is the common factor, the correlations are almost zero. A correlation of .29 is about 4 per cent better than chance. Heredity (common to one parent and child) and environment working together, as in the case of the real parent-child relationship, produce a degree of correlation for the four traits mentioned which is about 15 per cent better than chance.

By use of a statistical procedure which is far too complicated to be described here, Burks arrived at the conclusion that individual differences in total heredity account for about 80 per cent of intelligence, differences in environment accounting for the remaining 20 per cent.

Leahy also attempted to determine the relationship between intelligence of children and the respective factors of heredity and environment.<sup>22</sup> She employed two groups of children in her investigation. One group consisted of the real (biological) offspring of the parents with whom they lived. The other group was made up of children who were adopted into foster homes before the age of six months. They were five to fourteen years of age at the time of the study. In this latter group, it was assumed, there could be no relationship between the quality of the heredity of parents and that of the adopted children. To make the two groups comparable, each child in the adopted group was paired with a child in the other group on the basis of the real or foster parents' intelligence test scores and on the basis of objectively measurable environmental factors such as occupation and educational status. The correlation between the intelligence of the biological parents and the intelligence of their child must be accounted for on the basis of the combined effects of parental heredity and environment of the home. In the case of the foster parent-foster child combinations the correlation must be accounted for on the basis of the influences of environment alone. By comparing the size of the correlation coefficients for the parent-child combinations of the two groups, it was possible to calculate the contribution of measurable environment. The essential data are given in Table 42.

TABLE 42: *Correlations between I.Q. of Child and Various Factors*  
(Leahy)

| FACTOR                       | CORRELATION WITH<br>I.Q. OF FOSTER CHILD | CORRELATION WITH<br>I.Q. OF REAL CHILD |
|------------------------------|------------------------------------------|----------------------------------------|
| Education of father          | .16                                      | .48                                    |
| Education of mother          | .21                                      | .50                                    |
| Mid-parental intelligence*   | .18                                      | .60                                    |
| Mid-parental vocabulary*     | .34                                      | .56                                    |
| Environmental status of home | .19                                      | .53                                    |

\*In this table mid-parental intelligence is the average of the intelligence-test scores of the two parents; mid-parental vocabulary is, similarly, the average of the vocabulary scores of the two parents.

Notice that the correlations between real parents and real children are much higher for all the traits studied than are the correlations between foster parents and foster children. In other words, parental heredity plus environment of the home contributes more to the determination of the intelligence of the children studied than does environment alone.

We might well inquire also into the effect of consciousness of adoption upon the intellectual development of the foster children. Does consciousness of adoption create a barrier between foster parent and foster child which does not exist when there is a blood tie? This question must be left open at the present time, for there is no evidence which will answer it one way or another. Taking Leahy's findings at their face value, however, we are forced to attribute even more potency to heredity as a determiner of intelligence than that indicated by the Burks study.

It is interesting to examine some data showing the degree of relationship between biologically unrelated children reared in the same home. Freeman<sup>14</sup> and his co-workers obtained a correlation coefficient of this sort based on his data and some supplied from another source. His calculation shows that the correlation between the intelligence of two unrelated children reared in the same home is .34. This is considerably lower than the correlation of .50 found between blood brothers and sisters reared together in the same home. In the latter case, both heredity and environment contribute to the similarity in intelligence. We must of course deduct something from the coefficient of .34 (and from the comparable ones in the Burks study) to allow for the fact that children of the

same level of ability tend to be adopted into the same home. Even in the absence of any data on the occupation and education of the true parents, it is possible to estimate to a certain extent the intelligence of even a young baby.

In any attempt to appraise the relative contributions of individual differences in heredity as compared with individual differences in environment to the determination of individual differences in intelligence or any other mental trait, it must be borne in mind that the genes of the organism, as derived from the parents, have been passed down through many generations and contain determiners for many more traits than are visible in the parents themselves. Environment acts only during the lifetime of the individual. Heredity reaches into the depths of the far-distant past. The contribution of all of the pre-parental hereditary influences is bound to be a tremendous force in determining intelligence.

*Environmental factors may cause uneven development.* In a study by Saltzman, first-grade students in two New York schools were compared in performance on the Stanford-Binet examination.<sup>23</sup> The two schools differed widely in that the children attending them were drawn from the opposite ends of the social and economic scale. Group A was made up of 140 children from a school situated in a crowded slum area where the children had been subjected to all the evils of the depression practically from birth. Foreign languages were spoken in the majority of these homes. Group B was made up of 114 first-grade children from a school located in a superior residential section in upper Manhattan. In addition to the Stanford-Binet examination a Goodenough drawing test (a non-verbal intelligence test) was administered to each child individually in the two groups.

The average Stanford-Binet I.Q. for Group A was 101.8, and for Group B the average was 115, a difference of 13.2 points. On the Goodenough drawing test the average score for Group A was 103.2 and for Group B, 108.2—a difference of only 4.8 points. Saltzman found that Group A, made up of the underprivileged children, showed relative superiority on tests involving counting and handling of money, and sensory discrimination. Group B showed relative superiority on tests involving sentences and digits, rimes, and stating essential similarities and differences between

concrete objects. A good social and economic background with its greater opportunities for stimulation and development gives a child an advantage, aside from his inherent abilities, on verbal intelligence tests. The children from the slums were more pre-occupied with money, which was scarce in their hands, and dodging automobiles as they played in the street traffic.

*Will coaching raise the I.Q.?* It is natural for many people to look at the bright side of things. There are incurable optimists as well as incurable pessimists among us. It is not uncommon to hear laymen speak of intelligence as something which results mainly from study or specialized training. One experiment along this line will suffice to indicate the limits of "coachability" of the Stanford-Binet test performance. Graves investigated this problem by employing three groups of second-grade school children in each of two schools which were in similar neighborhoods and had pupils of similar ability.<sup>24</sup> At the beginning of the experiment all three groups were tested by well-trained examiners. Then followed two weeks in which one group, the *control group*, was given no special treatment and had no contact with the tests; the second group was coached on the items of the Stanford-Binet test, the correct answers given to them and explained in detail; the third group was given instruction on how to answer questions of a similar nature. At the end of the two weeks the three groups were again tested. The test was again administered after three months in which none of the groups received any training, and still again after a year of no training. Table 43 summarizes the results obtained.

TABLE 43: *Effect of Coaching on the I.Q.*

| GROUP                                 | MEAN I.Q.:<br>At time of<br>testing | At end of<br>coaching | After 3 mos.<br>of no coaching | After a yr. of<br>no coaching |
|---------------------------------------|-------------------------------------|-----------------------|--------------------------------|-------------------------------|
| <i>Control—no coaching</i>            | 86                                  | 90                    | 92                             | 91                            |
| <i>Coached in Stanford-Binet test</i> | 87                                  | 110                   | 105                            | 96                            |
| <i>Coached in similar materials</i>   | 93                                  | 100                   | 102                            | 97                            |

Examine the figures in the column headed "Control group." Notice that the group averaged four I.Q. points better the second

time it was tested. This plus other evidence suggests that the first testing will cause the child to do slightly better the next time but that the difference is very slight on the average. A difference of four I.Q. points is negligible in dealing with an individual case in clinic, court, or school. The group coached on the actual content of the Stanford-Binet tests shows more effect. Here there is an immediate rise from 87 I.Q. points to 110, an increase of 23 I.Q. points. At the end of three months following the coaching on the identical materials of the test, the average I.Q. had declined to 105; at the end of a year, to 96 or to a level but 9 I.Q. points above the pre-training status. Had these children been tested two or three years after the training period, their I.Q.'s would almost certainly have been back to the original pre-training level. In two or three years' time the children would have forgotten the items upon which they were coached, and they would also have grown to higher levels of the test not included in the original testing or training.

The children trained on items similar to, but not identical with, those of the test showed results somewhat like those of the children coached on the actual content of the test. The trend upward in the case of the similar group was not so pronounced as it was in the case of the identical group.

The final conclusions are: (1) taking the Stanford-Binet tests will cause the child to do slightly better the next time he tries; (2) coaching on the identical materials of the test causes a decided increase in the I.Q. obtained immediately after the coaching, but this increase is not permanent; and (3) coaching on similar materials causes a moderate increase in obtained I.Q. But there is nothing in the results of this experiment to indicate that there is any appreciable coaching effect in the proper use of the Stanford-Binet tests since they are usually administered at least six or eight months apart. More often, a period of years elapses between tests. Also, in administering the test a psychologist does not tell the child which answers are right and which ones wrong.

The student should keep in mind that the increases in test I.Q.'s brought about by coaching do not indicate that the actual intelligence was increased. Coaching increases the error in a test result but does not affect the fundamental mental age level of the



subject. The coaching effect is exactly analogous to that produced by putting a piece of ice in a feverish patient's mouth immediately before the thermometer is inserted. The ice will change the thermometer reading, but it will not alter the patient's temperature.

### *The Influence of Other Factors on Intelligence*

THERE ARE SEVERAL other factors which have a bearing on intelligence development. In addition there are many factors which have been commonly considered influences on intelligence but which in reality play no part in it at all.

#### *Intelligence and birth order*

Steckel found that first-born children are slightly inferior in I.Q. to those coming later in the family.<sup>25</sup> Since there is no known hereditary mechanism accounting for this fact, we attribute it to environmental effects.

The first child comes at a time when the economic status of the young parents is still improving. This factor, however, is probably far less important than the fact that the younger children are stimulated by and compete with the older ones.

#### *Month of birth and intelligence*

The astrologists of old preached that the stars influence our destiny. Many persons still believe it. For example, if you were born in September, you are said to be more intelligent than the average. If born under Venus, you should be happy and gay; under Saturn, false, envious, full of debate and law.

There have been a number of studies of intelligence-test scores of large numbers of individuals grouped by month of birth. A few such studies have shown consistent superiority in intelligence-test scores of individuals born in a certain particular month or season. One study reviewed by Held showed individuals born in the warm months of May, June, July, August, and September to be slightly superior to those born in the cold months of December, January, February, and March.<sup>26</sup> The difference between the averages was 1.5 I.Q. points. The subjects in this study were public-school children of all grades through high school.

It is quite possible that a selective factor influences the results in favor of children born in warm months. Children born in the summer months are more likely to enter school in September and follow through the grades in regular order. Children born in cold months who would come of school age at mid-term or after are a little older and hence, at a given age, have a little less schooling. We have seen that amount of schooling will influence the level of the I.Q. upward a few points.

Goodenough investigated the hypothesis that the superiority of the children born in the warm seasons might be due to selective planning of births by the more intelligent parents.<sup>27</sup> The months of birth of 3275 children were tabulated by parents' occupation. The children of the upper-income groups born in the warm months were superior to those born at other times of the year. Since the corresponding difference was not found in the case of the children of the poorer parents (who were presumably less likely to plan the births of their children), it was concluded that planning rather than seasonal influences was responsible for the slight differences observed in the superior group and hence in the total population.

All in all, there is no scientific confirmation of the popular belief that the month or season of birth influences I.Q. to a significant degree.

### *Racial superiority*

The problem of the possible superiority of one race or nation over another has been one of controversy, emotionalism, and totalitarian propaganda. We like to think we are better, or that our family is better, or our school, church, state, nation, or race is better. This will-to-believe sometimes leads us into strange and unconvincing attempts to explain facts. For example, in one study it was found that Indians are faster than whites in reaction time. One reviewer, full of the "Nordic superiority complex," argued that this result was just one more proof that the white race is one of supermen—they had a *greater capacity for inhibition!* We do not today know the answer. We do not know which races are superior and which are inferior. There are perfectly good reasons

why we do not know. The difficulties of controlling the significant variables have never been overcome by the very men and women who have devoted their lives to the study of the problem of racial superiority.

Lacking the answer, we can still guard ourselves against accepting a false answer. Here is a brief check of the obstacles to exact measurement of the native component in intelligence.

1. Language. Only persons whose native tongue is the one in which the test is built can be fairly compared.
2. Physical environment. One paper and pencil test of Samoans which was of the non-language or performance type gave misleading results because the children had never seen pencils before.
3. Culture. In communalistic societies, natives never understand that the test is not a coöperative venture to be discussed in meeting and solved coöperatively.
4. Errors of selection. Do we have a true cross-section of all of the elements in the parent group? Are the Japanese who come to the United States typical of those who stay in Japan?

Cecil Mann reviews the literature reporting the use of tests on various racial groups and comes to the conclusion:<sup>28</sup>

"For the present, however, it must be admitted that the evidence assembled for primitive peoples has not met these criteria of comparison, and until it does, or until new and valid techniques are established, the problem of race differences among primitive peoples remains unsolved."

Goldenweiser, an eminent anthropologist, summarizing his opinion as an expert who has read the work of others and who has made his own studies, goes even further in combating the racial-supremacy idea:<sup>29</sup>

"...as one becomes immersed in the study of racial psychology one comes to realize that the significant factor involved is not by any means the psychological differences of the races, but rather the psychical unity of man."

### *Intelligence and health*

There is a curious example of wishful thinking to be found in the popular belief that the child who is superior in intelligence

is inferior in physical health. We like to feel that nature balances things out. Numerous studies on this topic show that such a belief is false. Terman and his students made an intensive study of the health and physical characteristics of a large group of children of high I.Q.<sup>30</sup> The superior children were compared with a group of mentally inferior and were found to be better on the average in *every* desirable trait. The children of inferior intelligence suffered from more physical illness and possessed more bodily defects than the superior. This series of observations is consistent with the general hypothesis that heredity is a factor in both mental and physical development.

Malnutrition and intelligence. How does malnutrition affect I.Q.?

In attempting to deal with this relationship we must be on guard that all experimental variables are in hand. For example, we know that poor children on the average are less intelligent than those of well-to-do families, who incidentally are better fed. If we were to find that the underfed children in a public school were less intelligent than those who showed no medical symptoms of malnutrition, we could not conclude that low diet causes low intelligence. The dependable answer can be obtained only when we take a group of malnourished children and see if their intelligence changes with their nutritional condition. Numerous studies have been conducted on this important problem but with negative results. Schwesinger summarizes the conclusions from them all in stating that correcting a condition of malnutrition will make the individual more active and happier, but *it will not raise his I.Q.*<sup>31</sup>

Glandular imbalance and intelligence. As you saw in Chapter 2, the endocrine glands are structures located in various parts of the body which produce chemical substances affecting profoundly both growth and the individual's personality. The exact relationship between intelligence and these internal secretions is a tremendously complex problem which we are still only beginning to solve.

A. The thyroid gland. At the base of the neck and in front of the windpipe there lies a little structure called the thyroid gland that weighs less than an ounce in its normal condition. This gland becomes enlarged under certain circumstances, producing the dis-

order called goiter. Sometimes it fails to develop normally or is impaired or destroyed by disease. These conditions are capable of producing marked changes in the person's behavior.

Hypothyroidism is a condition resulting from too little thyroid secretion in the blood. Hypothyroidism existing from birth or an early age is called cretinism. In hypothyroidism the person becomes lazy and dull in manner. Intelligence declines when a once healthy thyroid gland fails to deliver an adequate supply of the secretion, and intelligence does not develop when the supply is cut off early in the life of a child. To see whether this loss could be regained, Bronstein and Brown followed the mental development of a group of hypothyroid cases under treatment in which thyroid was supplied from outside sources.<sup>32, 33</sup> The cases under treatment lost their dull appearance. Their physical condition improved. They became vivacious and animated in their behavior, but their I.Q.'s were not increased in the average case. There were, however, such large individual differences that the authors did not consider their findings as conclusive evidence in either direction. One case in which the treatment was started at two years of age and continued over a period of four years showed an increase from an I.Q. of 50 to one of 60 and remained at this level. The treatment was irregular enough to suggest that greater increases might have been found had the treatment been more consistent.

Mateer has recently reported considerable increases in the I.Q. of hypothyroid children subjected to prolonged treatment.<sup>34</sup> Such treatment is especially effective when started early. The following history of the developmental fortunes of David, a case of hypothyroidism, presents dramatically the effects of the administration of thyroxin and those of the failure to do so as well.

He is a tall, heavy boy of fourteen who shambles along the street with his shoulders sagging, his head bent, and feet dragging through puddles or mud unheedingly. He has been excluded from public school because of his low I.Q. He is never clean. His clothes are good, even expensive, but they soon bear the imprint of his carelessness as he spends his time wandering here and there.

His mother is an intelligent but rather ineffectual person whose days are filled with the bewildering complications of keeping house, and to whom life seems to be a jig-saw puzzle, always incomplete and muddled. The

mother's family are alert, energetic, money-making people who cannot understand her easy-going ways even though they know she is an hypothyroid case.

David's father is more or less like his wife. His people are farmers who have worked the same land for several generations. The son wanted to be "in business" and so his equity in a farm was traded for the store in which he now holds but a partnership. It is due only to the energy and intelligence of this well-chosen partner that the family has a sufficient income. David's father is heavy-set, affable, even loquacious, optimistic, slow, and not always veracious. He is no more disturbed by David's inability than is David's mother. When David gets older, says the father, he will send him down to an uncle's farm.

When David was three, he was seemingly a bright child, but he did not talk. If anything went wrong he would scream and bang with his toys until he had his own way. He was taken to several physicians for advice, but the fact that he did not talk was not reported to them. At 4 years 8 months of age he was given his first mental examination. He could pass only two tests on the Stanford-Binet and so was rated on the Gesell Scale. . . . These tests gave him an approximate level of 2 years 6 months or an I.Q. approximation between 50 and 60. There was no doubt of David's thyroid deficiency at that time. He was markedly overweight, with a very large abdomen, a dry skin, scanty, very dry hair, stubby wrinkled hands, and a large protruding tongue. He could use a few syllables to make his wants known, but was content to busy himself in destructive play which varied from pulling wallpaper off the walls to banging iron toys through windows.

The family took the suggestion that he again see a physician and have gland feeding started. After several weeks they consented to pay the bill if a teacher took David for an examination. They were very thankful for the suggestion that his medicine be given in the nursery group for young backward children to which he had been admitted.

Gradually he began to show gain. He learned cleanliness of toilet habits, obeyed simple commands, and found that constructive play was as interesting as destructive occupations. By the time of his fifth birthday he scored three years on the Stanford-Binet and made a similar rating on all the Gesell tests. This gave him an I.Q. of 60. His gain in the nursery group had been sufficient to warrant his being placed in a junior kindergarten group with other retarded little people whose age was about the same but all of whom tested at least half a year higher than he. He was the only gland-therapy child in the group of six, and it was very interesting to watch through the next year his relatively superior rate of development.

David was under constant school training, eleven months of the year, for the next five years. At the age of 6 years 3 months he scored a full 5 years on the Stanford-Binet, I.Q. 80. At this time he was started in a group who were doing work preparatory to first-grade activities. He handled the new tasks with great interest and even with eagerness. He was self-helpful and could come and go to school alone across several streets of heavy traffic. His speech was ample but rather defective in initial consonant sounds.

At 7½ years his I.Q. was 85; by 8½ it was 86; and when he was 9 years 8 months of age he reached an I.Q. of 90. David was at that time doing 2A work and easily made his promotion to the third grade. His scores on all sorts of performance tests were those of a ten-year-old. He was bright, alert, eager to try his best, and worked steadily at any and all sorts of assignments.

At this time he was placed in public school. The family had two younger children who were developing normally (?) under such instruction, and felt that David was far enough along to do satisfactory work under similar conditions. The only point of doubt which the writer had was that of the family's reliability for David's medication. For the whole period of five years that he had been followed his medication had been given under school supervision. During the holidays that were incident to such a long period, medicine had always been sent home in proper quantities and with proper directions. Invariably David returned with added weight, lowered temperature, more inert, tired, disinterested. Careful questioning about medication revealed again and again that some one had "forgotten to give it" to him. It seemed doubtful that they would carry prolonged responsibility any more conscientiously.

For the first half year David did quite well. He made his next promotion into 3A and had a satisfactory grade card. Then, quite abruptly, several weeks later, he was demoted to 3B. The school reported that he had just seemed to forget all he had known. A visit to the home soon determined the cause of the forgetting. David had had no thyroid for at least three months. His prescription had run out and no medicine had been procured with which to continue treatment.

This was the beginning of trouble. David did poorly in 3B and at the end of the year was transferred to a special class. In this he did fairly well in the early part of the next fall, but he gradually became less and less interested and more and more destructive. He tormented the other children, played truant, swore, laughed in the teacher's face when she reprimanded him. Re-examination showed that his I.Q. had dropped in a year and a half to 69. In spite of a lack of authority continued attempts were made to



get the family to realize his condition. They were very much annoyed at the "interference" and finally sent him out of town for a year. When fourteen he was again examined. All of the earlier hypothyroid signs were there again. The I.Q. was only 50. He had not only stood still mentally, but had lost a tremendous amount of his earlier ability. In an effort to attempt rehabilitation David was offered a summer of corrective "hand-work and occupation" free of charge *if* they would put him on thyroid again. The father promised to send him, but when the time came they had "gone to the World's Fair."

Since that time David wanders the streets. His brothers are beginning to have their own difficulties, although neither shows as much retardation as David. The mother still potters around home, the father helps in the store to which he has now lost all ownership. Just this past winter David was among a group of boys arrested for stealing candy and trinkets from a neighborhood store. Let off with a reprimand, because of his inferiority, what can the future hold for him and the community in which he lives but trouble and more trouble?

The correlation between increases in I.Q. and medical treatment for thyroid deficiency, on one hand, and the losses in I.Q. at those periods in which such treatment was neglected, on the other, indicates that there is, in some cases at least, a close relationship between intelligence and under-activity of the thyroid.

There is probably no real conflict between the results of Bronstein and Brown and those of Mateer in that both indicate that early and careful treatment may be effective.

~~B. The parathyroid glands.~~ When surgeons first started to remove the thyroids, they did not realize the importance of the function of four little glands about the size of buckshot lying close to the thyroids. In cases in which these little parathyroid glands were removed by accident pronounced changes in behavior occurred. The patients became very excitable and developed severe and painful muscular cramps. The secretion of the parathyroids is a soother rather than an excitant like that of the thyroids. Physicians believe that an excess of parathyroid secretion will cause the person to become lazy and dull in manner. The person who must sleep a great deal more than the average may have an excess of parathyroid secretion.

The case of Phyllis as reported by Mateer makes clear the effects of too little secretion of the parathyroid glands.<sup>35</sup>

Phyllis was only twenty-five months old when first seen. The examiner was most thankful that she was not bigger and hence harder to handle. She yelled, screamed, kicked, and bit. She threw herself on the floor and banged her own head against the wall. Then she sat up, looked around, and started all over with a new group of tricks. She was examined because of her disturbing behavior. Incidentally, the mother reported a history of repeated convulsions, coming every few days, from the time she was a few months old until nearly two. They had occurred less frequently in the few months before the examination. The mother was so worn out with the care of the child that all such past history seemed blurred together in her mind and a more definite statement could not be obtained.

At this time Phyllis tested a fifteen-month level. She was so excitable that no measure of actual trainability could be determined. Every effort was made to have the mother plan for systematic unemotional care of the child. Contact was established with a physician, and determination was made of a calcium deficiency severe enough to be called an infantile tetany. However, nothing followed the diagnosis. Treatment was kept up a few weeks and then discontinued.

When Phyllis was next seen she was just 5 years 2 months of age and had become impossible at home. The convulsions had continued at irregular intervals. All sorts of behavior disturbances had added themselves to the tantrums she had shown three years before. The community was in agreement that "something should be done about the child." So Phyllis was placed under observation, with training and treatment to follow. At this time she scored just 2 years 10 months. Her earlier I.Q. of approximately 60 had dropped to 55. She could talk very little, and usually responded by repeating the last syllable of what was said to her. She was unable to do anything on any standard performance test. She was over-aware of everything around her, very restless, destructive, and soon developed a tantrum because she was asked to do new things.

For several weeks all sorts of efforts were made to adjust her to her new environment and the new demands. No change in her reaction to them was apparent. She was constantly antagonistic, so twenty days after she came under observation calcium therapy was begun. No real gain showed, and in another two weeks parathyroid was added. Within the next two weeks there were a number of signs of gain. Phyllis concentrated for longer periods, tried to talk a great deal with much clearer sounds, slept better, played with other children with less disturbance.

Within three months she was a normal member of a five-year-old play group. At 5 years 6 months of age she scored 5 years 2 months, or an I.Q. of 94. Her rating on all other performance tests was between four and six years.

The most interesting feature of this case is the fact that Phyllis has never had a convulsion from the time calcium and parathyroid were started. She is now eight years of age, in 2A, doing very efficient work, but held back by a remnant of speech defect. She has maintained an I.Q. constantly within 5 or 6 points of 100.

c. The anterior pituitary. Attached to the under side of the brain is a small organ known as the pituitary body (p. 53). The organ has an anterior and posterior part whose functions are quite different. Over-activity of the anterior lobe of the pituitary body causes marked disturbances in growth, as we have seen. Under-activity affects growth too, but it also affects intelligence as the following case history illustrates.<sup>36</sup>

When first seen, Letitia was twelve years of age. One would not have thought of her as a child in any way, for she was large, awkward, as cumbersome in getting around as a middle-aged and lethargic woman. She was reported incompetent in all forms of schoolwork, incompetent at home, everywhere. The family just wanted her "kept busy" somewhere, so that they did not have the whole-time responsibility of her.

It was very difficult to work with Letitia. She sat with head averted, would not look directly at the examiner or at test materials. She answered in monosyllables only. Sometimes it took four or five repetitions of a question to get any answer at all. She never said she did not know a thing, but just sat silent.

At this time she tested 6 years 10 months, which gave an I.Q. of 54. Such a rating would seemingly place a girl of her age in the hopeless group of imbeciles or low-grade morons, but Letitia gave some indications of being more capable than she rated on actual tests. She could read with third-grade accuracy. She enunciated fairly well. She had little or no concept of what she read. The words had no content or meaning. She could not discuss or retell stories she had read if they were more difficult than first-grade work. Due to her age and the number of years spent in grade work, she had developed the mechanical ability to pronounce most ordinary words, but they had built up no other associations in her mind. She was no more capable than her level would indicate in any other school subjects. Her spelling was just a meaningless jumble of letters, even the combinations to ten were failed, and she had no background of information in other subjects.

Letitia's family were not at all interested in the correction of her condition, which they considered impossible. The other sisters and brothers were all of more than average ability and were utterly chagrined by their

relationship to her. The whole family denied possibility of anyone else in the family having any such similar handicap. Letitia had been ill as a small child with first one and then another childish disease. They felt her condition was due to that.

However, when they found that she did not gain in schoolwork and that the hope of improvement was held out with medical treatment, consent for a medical examination was given. Letitia showed gross overweight, a subnormal temperature, awkward bodily control, stooped posture, very well-developed adolescence. . . . Needless to say she was immediately placed upon pituitary feeding.

In the six months since this treatment was started Letitia has developed into such a different person one could scarcely recognize her. Shortly after gland therapy was begun, she started to talk spontaneously, to offer comments in class discussions, to take small responsibilities as her own. Her posture improved until it was very satisfactory. By leaps and bounds she covered in six months more than two grades of arithmetic requirements, a similar amount in spelling, and improved reading until she could understand the significance of fourth- and fifth-grade reading assignments. Her mental age, which showed no gain in the first months under schooling without gland therapy, has developed to a rating of 10 years 2 months at the age of 13 years 9 months, giving an I.Q. of 74. All other tests indicate similar gain. Her school achievement by formal tests has changed from failure to an average rating of the ninth month of third grade.

The biggest change is in Letitia's emotional response to the world in general. She is alert, happy, eager for new experiences, and takes pride in every new phase of her own ability. She gives every indication of the potentiality for continued mental growth. Her family cannot as yet accept the change, but watch her fearful that there will be a return of the earlier incompetency and apathy.

*The effect of diseased tonsils and adenoids.* How often has the family doctor assured the worried mother that Johnny will do better in school when his infected tonsils or adenoids are removed? Unfortunately, such a doctor is over-optimistic. A careful experiment by Rogers seems to settle this point.<sup>37</sup>

This worker matched twenty-eight children whose tonsils or adenoids were diseased with another similarly afflicted group. One afflicted group was operated on in the usual manner; the other was permitted to go unoperated. Retests at the end of six months showed that the mental ages of the operated group had not increased above those of the unoperated group. The retests were

given long enough after the operations so that any temporary weakening effect of the surgical manipulation would have disappeared.

Lowe also reports similar negative results in an equally well-controlled experiment.<sup>38</sup> Lowe combined her data with those of Rogers and arrived at the following conclusion. There was an average increase of 2.2 I.Q. points in the operated group as against an increase of 4.1 for the unoperated. The obtained difference in the combined studies is not enough to suggest that the removal of diseased tonsils actually lowers the I.Q., but it does reveal very clearly the essential falsity of the opposite conclusion. Although these operations may have other beneficial effects, they will not increase the I.Q.

*Cerebral syphilis and mental deterioration.* It is a well-recognized fact in every mental hospital and clinic that syphilis can attack the nervous system and brain and bring about lowering of intelligence. The writer had an opportunity to study the progress of this disease in a young army officer of superior initial intelligence. As happens in rare instances, all attempts of the physicians to arrest the progress of this disease failed. Over a period of one year the patient fell two years in mental age. In this connection, it is interesting to note that the deterioration was "spotty." That is to say, the patient lost far more in certain test abilities than in others. His ability to define words was less affected than his ability to solve problems.

Psychologists attached to mental hospital clinics have learned that the degree of spread of the failures on the Stanford-Binet test is useful in arriving at the diagnosis of this condition. The person suffering from mental deterioration of syphilitic or other organic origin will frequently spread his failures over five or six levels of the test, i.e., he will fail some tasks at the ten-year level and pass others at the average adult or superior adult level.



Intelligence is the capacity of an individual to meet new situations through the use of what has been previously learned. Individual differences in intelligence are great. These differences are measured by means of standardized tests which permit of the expression of degree of intellectual development in terms of the

ability of average individuals of a given age. When a person can pass the tests which the average person of 10 years of age passes, we say that the person has a mental age of 10. Other mental ages are similarly defined. The I.Q., or intelligence quotient, is obtained through dividing this mental age by the actual or chronological age. The I.Q. for a given person tends to be constant. The constancy of the I.Q. could be explained theoretically as resulting from constancy of the environmental opportunities which confront the individual or as a result of strong hereditary forces guiding the development of intelligence more or less independently of environmental influences. The analysis of numerous studies indicates that heredity is apparently more important than environment in determining individual differences in intelligence as measured by standard tests.

### *Recommended Readings*

CATTELL, R. B. *The Fight for Our National Intelligence*. P. S. King, 1937.

The author finds a high degree of inheritance of intelligence and discusses various consequences of the decline of our average intelligence.

PETERSON, J. *Early Conceptions and Tests of Intelligence*. World Book Company, 1925.

The ancient history of intelligence differences and an account of practices in testing them are presented.

TERMAN, L. M., and MERRILL, M. A. *Measuring Intelligence*. Houghton Mifflin, 1937.

This is the classic volume on the methods of standardizing and the administering of the new revised Stanford-Binet tests of intelligence.

TOWN, C. H. *Familial Feeble-mindedness; a Study of One Hundred and Forty-One Families*. Foster & Stewart, 1939.

Low I.Q., misery, crime, sickness, broken homes, economic incompetence all go together.

WECHSLER, D. *The Measurement of Adult Intelligence*. Wood, 1939.

A discussion of the nature of intelligence and a description of a test standardized on adults.

*"He that hath a trade hath an estate; and he that hath a calling hath an office of profit and honor."* FRANKLIN

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## CHAPTER 14

# VOCATIONAL AND EMPLOYMENT PSYCHOLOGY

*How psychology helps to find the best job for the man and the best man for the job. How the man is made better for the job and the job made better for the man through the use of psychology.*

**E**MPLOYMENT, whether it be a job or a profession, is a business-like agreement between the employer and the employed or between the consultant and his client. Like any good business relationship this one should be of mutual advantage to both parties. A business relationship cannot be a happy one when either party becomes dissatisfied with the terms of the contract. Nor can the transaction be advantageous when either party promises more than he is able to deliver.

Modern psychology has been applied to the problem of increasing not only the efficiency of the worker but also that of the employer. The tragedy of industrial disputes and of vocational maladjustment can in many instances be avoided by the application



of the principles and methods of vocational and employment psychology.

### *Choosing Your Life Work*

WHAT AM I best fitted for? Should I enter a profession, or should I learn a trade? In what occupation am I most likely to succeed? What kind of work will I like best? These are questions which young people who have years of preparation ahead of them should be asking themselves now. There is no one quite so pathetic as the mature person who is still groping for a secure footing in our economic society.

Carlyle believed that if you do not find happiness in your work you will never find it in your life. Recent investigations of job satisfactions show that Carlyle was right. People who do not like their work usually dislike life itself. The average person spends about as much time at work as he does in sleeping, more time than he devotes to play. Our job if properly chosen gives us opportunity for expression of several fundamental motives.

There has always been, and probably always will be, a great need for vocational guidance. It has only been in the last ten years, however, that adequate methods of scientific vocational guidance have become available and even more recently that the general public has become aware of them.

An essential part of social planning at any time is the placing of the members of society in occupations in which they will be happiest and most successful. When unemployment is widespread and jobs are hard to get, the problem of proper vocational guidance becomes acute.

Numerous studies have shown that the average college student is not capable of making the choice of a vocation unaided. All too often he knows next to nothing about the various jobs and occupations that are open to him. He has no accurate conception of the special abilities and other psychological characteristics which are required to succeed in a particular vocation. Nor is he able to appraise his own store of interests and abilities. Where at all possible, accordingly, he should seek the services of a vocational counselor who has accurate knowledge of the requirements of the nu-

merous occupations and can determine what abilities he has and what fields offer him the greatest chances of success and happy adjustment.

A person planning his life work must ask himself certain questions about himself in relation to any vocation under consideration:

1. How much general education is required of people to enter into this particular occupation? Have I the required schooling, or how can I get it?
2. How long a period of specialized training is necessary? Where can I get it? What will it cost?
3. How much intelligence is necessary to succeed in this occupation? How far above or below the average successful person in this field am I?
4. What special capacities are required? Do I have them?
5. What are the physical requirements? Is it indoor or outdoor work, standing or sitting work? Does it require long irregular hours? Are the requirements such that my health can stand it?
6. Will the activities required by this vocation give me the satisfaction I desire? Will I find pleasant surroundings in which to work and congenial people with whom to associate?
7. How much could I expect to earn in this occupation? Are there exceptional financial rewards for individuals of exceptional ability? What are the opportunities for advancement? Is it a blind-alley occupation, or does it lead the way to other more interesting and profitable lines of work?
8. How much security does it offer? How keen is the competition? Is the work steady or intermittent?
9. Of what value to society could I be in this work? Would my friends admire me if I succeeded, or would they look down upon me for following it?

These are only a few of the questions which each individual must ask himself and answer to his own satisfaction if he is to choose his career wisely.

### *What the job requires of you*

Let us consider some of these questions in greater detail, first seeing what the job demands of you.

*Education required.* For any job there are certain educational requirements. For some a high-school education is sufficient. Others demand a college degree. For others the individual must take specialized courses lasting sometimes a few weeks, sometimes several months or even longer. Find out what training is required for different jobs that interest you; then select a vocation for which you have, or can have, the training necessary.

*Intelligence required.* Numerous psychological surveys have shown direct relationship between level of intelligence and success in a particular occupational activity. These studies show that a person may fail to make good in a particular occupation if he is either too low or too high in intelligence. The individual whose intelligence is too low for his job soon becomes unhappy. He is called upon to make judgments concerning matters which are far too complex for him to understand. As his errors pile up and become more and more noticeable to his superiors and associates, his feelings of frustration and discouragement mount. The individual whose intelligence is too high for his job presents a picture no more pleasing. A highly intelligent individual on a routine job soon becomes bored with its monotony. The tasks which confront him are not complicated and difficult enough to challenge his interest. His maladjustment becomes apparent to others and to himself. He wastes valuable time day-dreaming.

Viteles collected figures (Table 44) to show the relationship between the intelligence level of cashiers in a chain of restaurants and the length of their service in that capacity.<sup>1</sup> Notice that the

TABLE 44: *Relationship between Intelligence Test Scores of Restaurant Cashiers and Their Length of Service*

| RANGE OF INTELLIGENCE           |                              |
|---------------------------------|------------------------------|
| TEST RAW SCORES<br>(NOT I.Q.'s) | LENGTH OF SERVICE<br>IN DAYS |
| 10-19                           | 3                            |
| 20-29                           | 91                           |
| 30-39                           | 156                          |
| 40-49                           | 142                          |
| 50-59                           | 107                          |
| 60-69                           | 100                          |
| 70-79                           | 96                           |
| 80-89                           | 87                           |
| 90 plus                         | 35                           |

cashiers who earned scores on the intelligence test between 30 and 39 stayed on the job 156 days. Those whose test scores ranged between 10 and 19 lasted only 3 days. Obviously these girls did not have sufficient mental alertness to do their work well.

In the table on the opposite page you will see the intelligence standard for certain representative occupations.

The average score is the mean of the scores earned by the members of an occupational group. These figures are based on the results of the vast testing program carried out by the United States Army during the World War. The figures, originally obtained for drafted men, have been revised in some instances on the basis of more accurate information obtained later from testing civilian groups. The score range and I.Q. range indicate the scores which mark off the middle half of the individuals engaged in that particular occupation.

The soundness of this analysis is substantiated by the results of many studies which reveal an optimum or ideal intelligence for each particular line of work. There is a process of natural selection, which tends to adjust individuals to their jobs. Those who are too low in intelligence to do the task assigned to them either become discontented and seek work in which they can succeed, or they are weeded out by their employers. Individuals who are too intelligent for their work eventually become bored and quit, or they are promoted to more interesting work which puts a greater demand upon intelligence.

It is not sufficient to know, however, how much intelligence is required for success in a vocation that interests you. Naturally in attempting to choose your vocation you must know your own intelligence level. The best way to determine this, of course, is to take one of several standardized intelligence tests. The practice of testing students in high schools and colleges is growing so rapidly that before long any student in a progressive community can reasonably expect to be tested and informed of his standing by the time his need for the information is encountered.

It is possible for the individual who does not have access to the results of a formal test of his intelligence to estimate his own intelligence from his school record. There is a high positive correlation between intelligence as measured by standard tests and

TABLE 45: *Intelligence Levels Typical of Various Occupations, As Shown by Army Alpha Test Scores*

| OCCUPATIONAL GROUP             | SCORE   | AVERAGE | I.Q.    | AVERAGE |
|--------------------------------|---------|---------|---------|---------|
|                                | RANGE   | SCORE   | RANGE   | I.Q.    |
| Engineer                       | 110-183 | 161     | 109-141 | 132     |
| Clergyman                      | 124-185 | 152     | 115-142 | 128     |
| Accountant                     | 103-155 | 137     | 106-129 | 121     |
| Physician                      | 107-164 | 127     | 108-133 | 117     |
| Public-school teacher          | 97-148  | 122     | 103-126 | 114     |
| Draftsman                      | 84-139  | 114     | 97-122  | 111     |
| Y.M.C.A. sec'y                 | 99-163  | 111     | 104-132 | 109     |
| Dentist                        | 80-128  | 110     | 96-117  | 109     |
| Executive (minor)              | 81-137  | 109     | 96-121  | 108     |
| Stenographer and typist        | 73-124  | 103     | 92-115  | 106     |
| Bookkeeper                     | 77-127  | 101     | 94-117  | 105     |
| Nurse                          | 78-126  | 99      | 94-116  | 104     |
| Clerk                          | 74-121  | 96      | 93-114  | 103     |
| Telegrapher and radio operator | 57-110  | 85      | 87-109  | 98      |
| Railroad conductor             | 64-106  | 83      | 88-107  | 97      |
| Shipping clerk                 | 54-102  | 78      | 84-106  | 94      |
| Policeman and detective        | 46-90   | 69      | 81-100  | 91      |
| Auto mechanic                  | 43-91   | 65      | 79-101  | 89      |
| Carpenter                      | 44-88   | 65      | 79-99   | 89      |
| House painter                  | 38-81   | 59      | 77-96   | 86      |
| Day laborer                    | 13-47   | 21      | 66-81   | 69      |

grades in high schools and colleges. If you have been consistently at the top of your classes over a period of time, you can be certain that you are more intelligent than the average of your classmates. In attempting to judge your intelligence from the quality of your school work you must, of course, keep in mind and make allowances for how hard you have worked. Self-estimates are at best difficult to make and are to be used only when a more accurate test measurement is not available.

Having determined your intelligence level, you can be certain that if your I.Q. or Army Alpha intelligence-test score falls within a particular range indicated in Table 45 you will be well adjusted to that particular occupation at least in so far as your intelligence is concerned.

3 What special abilities are required? Most occupations require

certain special abilities. A violinist, for example, must have a keen sense of pitch, time, intensity, and rhythm. The possession of these special abilities is essential to success in music. An aviator must have a set of sensory equipment which is almost perfect. An engineer's work demands the use of complicated mathematics, the learning of which calls for a special ability. The student who has difficulty with mathematics would do well to think of some vocation not calling for this special ability. The surgeon needs good vision and good motor coördination. The navigator cannot be color-blind. The professional designer, whether of women's clothing or of machinery, must have a high degree of ability to think about spatial relationships.

Standardized tests are available for many special abilities. Among these should be mentioned particularly the Art Judgment Test by Meier and Seashore; the Seashore, or Kwalwasser, Test of Musical Talent; the Ishihara Test for Color-Blindness; the Minnesota Test of Mechanical Aptitude; the Minnesota Manual Dexterity Test; and the Minnesota Paper Form Board which measures the special ability involved in visualizing relationship of objects in space. The subject of special aptitude testing is far too complicated for anything but a brief treatment in a book of this sort. Your instructor, however, can help you take inventory of your special abilities by administering tests to the class as a whole or to you as an individual, or by referring you to a consultant who is well trained to do that type of work.

④ What are the physical requirements? Each occupation makes its own peculiar demands on the physique and health of its followers. The life of a country doctor, for example, is extremely hard. He is frequently called from his bed to travel in the worst of weather. Nor is the life of the city physician always easy. During epidemics or other emergencies physicians may be required to work day after day with only two or three hours' sleep. Civil engineers and geologists often work in extreme climates and in bad weather. Police officials and detectives must frequently lose sleep while working on an important case. The detective's duty sometimes keeps him crouched in cold damp corners waiting long hours for his suspect. The danger of being injured by knife or bullet is a relatively unimportant occupational hazard in police work. In

choosing a vocation it is important to bear in mind the physical requirements, selecting something in keeping with your actual physical strength and ability.

There are numerous occupations and professions in which some individuals with serious physical handicaps have attained or maintained success. A very successful lawyer in a large mid-western city is blind. A familiar example is Lionel Barrymore, carrying

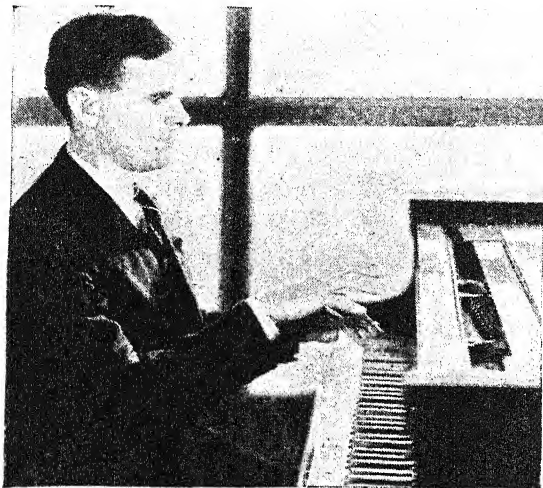


FIGURE 68. *Physical requirements of a calling, while important, indeed at times vital, are often relative. Lacking the prime factor of sight, Alec Templeton has nevertheless risen to virtuosity and fame on his piano.*

on his professional activities as the irascible Dr. Gillespie in the *Dr. Kildare* series of motion pictures while confined to a wheelchair. Perhaps the most outstanding example today of an individual going on with a successful career although suffering a serious physical handicap is President Roosevelt. All these people were, however, well established in their careers before suffering a physical handicap. There are equally numerous instances of individuals who have succeeded brilliantly despite a handicap existing from birth or an early age. In the field of public entertainment is Alec Templeton, who rose to fame despite blindness. One of our foremost physicians, himself a sufferer from a particular type of paralysis due to birth injury and handicapped further by youthful poverty, became the world's outstanding authority on the very condition from which he suffers.

② *What temperament and personality are required?* In many types



of work, personality and temperament are as important as intelligence. Inspectors, accountants, and research men are usually introverted, since the process of natural selection and the exercise of voluntary choice have eliminated the extroverts, who are ill-adapted to work done in the absence of close human contact and requiring a minute attention to details. On the other hand, salesmen, foremen, and others whose work involves getting action from people are typically extroverted. Most business and industrial executives tend toward the extroverted side of the distribution, but there are certain executives specializing in organizing and planning who may be somewhat introverted. Successful salesmen and supervisors must be aggressive in face-to-face relationships with people. Scholars may be submissive in social situations without impairing their efficiency. Physicians must be emotionally stable. The sick person freely places himself in the hands of his doctor and expects the physician to be sure of himself. The young man who plans to enter the army or navy for a career as officer must be emotionally stable in order that he can stand the rigors of war and set the proper example for his men. Experience during the last war indicated the folly of permitting emotionally unqualified men to enter active military service. During the present emergency such mistakes are not being made. The young man of neurotic disposition is given a deferred rating even though he is physically fit. This practice will prevent much mental suffering and will go far in building the efficient fighting units necessary to defend this country against any enemy.

Elwood compared nurses with college girls on the basis of emotional stability and introversion-extroversion.<sup>2</sup> The nurses show far fewer emotional troubles as a group than do college girls and are decidedly more extroverted. It is interesting that the girls who elected child nursing are less extroverted and less stable emotionally than the other nurses.

### *What satisfaction does the work give?*

It is estimated that at least one-third of the workers in the United States are dissatisfied with the conditions of their work. The dissatisfaction of workers manifests itself in strikes and walk-outs, excessive labor turnover, and in negative and carping atti-

tudes toward the job and even toward family and friends. Strikes are not all caused by purely psychological factors, of course. Many strikes are mainly economic in nature and result from unfair wages or represent attempts of unions to better working conditions.

The degree of dissatisfaction among those engaged in the professions is found to be much lower. At the professional level, however, dissatisfaction must be kept to oneself. People will not knowingly choose a doctor who hates medicine or a lawyer who spends more time dreaming about being an explorer than preparing the briefs for his clients' cases. Perhaps dissatisfaction is higher among the professions than surveys indicate.

*What satisfactions do you require?* What do you regard as success? Is the man who makes the most money the most successful? Or is it the man who works the fewest hours? Is the boss happier than the bossed? Each person will have his own answer to these questions. The successful person is the one who gets what he wants, who is satisfied with his work. To be happy in your work and hence to be happy in life, you must search and appraise your motives critically and carefully. Then you must find the work which offers the rewards that you crave.

The financial rewards are of the first importance to some, of little importance to others. Are you the kind who must "keep up with the Joneses"? If so, you must give attention to financial rewards afforded by any occupation you are considering.

Do you require the respect or even envy of your fellows, or are you capable of living happily in the knowledge that you are doing what you yourself want to do regardless of what others think of it? If you are the sort of person who must have social approval, you will be interested in a study aimed at rating the social standing of members of various professions and other callings.<sup>3, 4</sup> College students rated the prestige of various occupations, with the results shown in Table 46 on the following page. Why did prestige of the banker fall off a little between 1929 and 1939?

*Interest patterns.* Many lines of evidence show that success in a given occupation depends upon our pattern of interests as well as upon our abilities and other qualifications.

However, the individual is not to be trusted to analyze his own interests in deciding upon a vocation. Frequently students who

have their minds set on a particular profession find upon submitting to searching appraisal that they do not have the fundamental interests called for by the profession which they plan to enter. The motives which lead young people to choose their vocations are frequently quite superficial, or at least unreliable. All too often the choice is based on some incidental consideration which is in reality quite unimportant. A man who likes to travel might think that he wants to be an explorer, forgetting the hardships and loneliness which befall the followers of that occupation. Another might want to become a doctor, because doctors are supposed to make good livings. Still another young man or woman might wish to enter the law and enjoy the thrill and drama of a court trial, forgetting that the lawyer's work is mainly done at his

TABLE 46: *Rank Order of Twenty-Five Occupations in Social Prestige as Rated by College Students*

| OCCUPATION        | 1929 | 1939 |
|-------------------|------|------|
| Banker            | 1    | 5    |
| Physician         | 2    | 1    |
| Clergyman         | 3    | 3    |
| Lawyer            | 4    | 4    |
| Professor         | 5    | 2    |
| Manufacturer      | 6    | 6    |
| Artist            | 7    | 8    |
| Man of leisure    | 8    | 9    |
| Engineer          | 9    | 7    |
| Factory manager   | 10   | 10   |
| School-teacher    | 11   | 12   |
| Merchant          | 12   | 11   |
| Baseball player   | 13   | 14   |
| Farmer            | 14   | 13   |
| Insurance agent   | 15   | 17   |
| Salesman          | 16   | 15   |
| Bookkeeper        | 17   | 18   |
| Machinist         | 18   | 16   |
| Carpenter         | 19   | 21   |
| Barber            | 20   | 23   |
| Factory operative | 21   | 20   |
| Blacksmith        | 22   | 22   |
| Soldier           | 23   | 19   |
| Chauffeur         | 24   | 24   |
| Ditch digger      | 25   | 25   |

desk outside of court hours. If the choice of a vocation is left to such whims, there is strong reason to suspect that many of the choosers will be unadjusted and unhappy in their work.

The Strong Vocational Interest Blank is of great value in predicting the degree of satisfaction that you would actually obtain from engaging in the various occupations for which scores are available.<sup>5</sup> It is based on results of extensive researches in which successful members of various professions and occupations indicated their reactions to items, such as the following samples:

Parts Ia and Ib. *Occupations*. Indicate after each occupation listed below whether you would like that kind of work or not. Disregard considerations of salary, social standing, future advancement, etc. Consider only whether you would like to do what is involved in the occupation.

Draw a circle around L if you like that kind of work.

Draw a circle around I if you are indifferent to that kind of work.

Draw a circle around D if you dislike that kind of work.

*Work rapidly*. Your first impressions are desired here. Answer all the items. Many of the seemingly trivial and irrelevant items are very useful in diagnosing your real attitude.

Actor (not movie).....L I D    Lawyer, Criminal.....L I D  
Advertiser.....L I D    Lawyer, Corporation.....L I D

Part II. *Amusements*. Indicate in the same manner as in Part I whether you like the following or not. If in doubt, consider your most frequent attitude. *Work rapidly*. Do not think over various possibilities. Record your first impressions.

Golf.....L I D

Fishing.....L I D

Hunting.....L I D

Part III. *School Subjects*. Indicate as in Part II your interest when in school.

Algebra.....L I D

Agriculture.....L I D

Arithmetic.....L I D

Art.....L I D

Bible Study.....L I D

Bookkeeping.....L I D

Part VII. *Comparison of Interest between Two Items*. Indicate your choice of the following pairs by checking in the first space if you prefer the item to the left, in the second space if you like both equally well, and in the

third space if you prefer the item to the right. Assume other things are equal except the two items to be compared.

*Work rapidly.*

Street-car motorman..... ( ) ( ) ( ) Street-car conductor  
 Policeman..... ( ) ( ) ( ) Fireman (fights fire)  
 Chauffeur..... ( ) ( ) ( ) Chef  
 Head waiter..... ( ) ( ) ( ) Lighthouse tender

The test is scored differently for each occupation. A particular answer to any item contributes a certain number of points toward the total score for that occupation, depending on the extent to which it has been found to differentiate between the successful followers of a particular occupation and those who were successfully following other occupations. Of course, no one item would tell the story, but when all the item scores are added up, a total measure is obtained which has a high degree of validity in indicating the occupation for which one is temperamentally fitted.

If a person has interests largely the same as those of men and women whose records prove them to be successful, he has a better chance of a happy and successful career in that occupation than the individual whose interests lie along decidedly different lines. Fortunately, interests, intelligence, and special aptitudes are not highly correlated, so that measurement of the pattern of a person's interests adds something new to the prediction of vocational adjustment based on intelligence and special ability.

The value of interest tests in predicting vocational success is shown clearly in Table 47. Life-insurance agents filled out the Cowdery Interest Test, supplying also figures showing the amount of insurance they had sold during a period of three years just preceding. The Cowdery Interest Test was a forerunner of the Strong Test and was constructed along the same lines.<sup>6</sup>

TABLE 47: *Relationship between Score on Cowdery Interest Test and Average Yearly Sales of Life-Insurance Agents*

| LIFE-INSURANCE<br>INTEREST SCORES | AVERAGE YEARLY SALES<br>IN THOUSANDS OF DOLLARS | NUMBER OF<br>AGENTS |
|-----------------------------------|-------------------------------------------------|---------------------|
| C                                 | 58                                              | 3                   |
| B-                                | 55                                              | 16                  |
| B                                 | 126                                             | 14                  |
| B+                                | 167                                             | 18                  |
| A                                 | 289                                             | 16                  |

There are now scoring keys with which to determine a man's temperamental fitness for some thirty professions and occupations. About half that number are now available for women.

*How interests cluster.* Thurstone employed an intricate method of statistical analysis to determine the number and nature of the factors accounting for similarities and dissimilarities among the interests of members of eighteen professions and occupations.<sup>7</sup> He found that there are four fundamental clusters of interests, which are represented in varying amounts in the members of the various callings. These clusters are: interest in science, interest in language, interest in people, and interest in business.

Advertising copywriters dislike science, like languages, dislike people slightly, and like business mildly. Psychologists, chemists, and medical men are typically more interested in science than they are in people. Ministers, teachers, Y.M.C.A. secretaries, and personnel workers are more interested in people than in science. Journalists are more interested in language than in anything else, as are also lawyers, artists, and advertising copywriters. Studies of the sort that Thurstone has conducted suggest that eventually all professions and occupations can be grouped according to the basic interest clusters involved. As it is, we must, to be on the safe side, treat each profession as something separate and distinct and apply as many batteries of tests to the individual as there are professions or occupations open to him.

### *What opportunities exist?*

Whether a job of the kind you want is available is not a psychological problem, but it is a very important one. One way of determining the likelihood of finding an opening in the line of work you are considering is to note the number of individuals engaged in that occupation. In general, if the number of individuals engaged is large, you can reasonably expect to find employment if you have the ability, training, and personality characteristics required. If, on the other hand, the number of individuals engaged in that occupation is small, you can expect either the competition to be very keen and the demand for those services limited or some undesirable and unattractive feature which keeps people out of the occupation in question. Table 48 shows the number of men

and women engaged in the various professions according to the United States Census of Occupations.

TABLE 48: *Number of Persons Engaged in Each of Sixteen Occupations (1930)*

| OCCUPATION                   | NUMBER OF PERSONS |
|------------------------------|-------------------|
| Teachers                     | 1,125,000         |
| Civil engineers              | 507,000           |
| Trained nurses               | 294,000           |
| Musicians and music teachers | 165,000           |
| Lawyers                      | 161,000           |
| Physicians and surgeons      | 160,000           |
| Clergymen                    | 145,000           |
| Draftsmen and engineers      | 103,000           |
| Dentists                     | 71,000            |
| Artists and art teachers     | 57,000            |
| Chemists and metallurgists   | 47,000            |
| Actors                       | 38,000            |
| Librarians                   | 31,000            |
| Architects                   | 22,000            |
| Veterinarians                | 12,000            |
| Authors                      | 12,000            |

The defense-industry boom has, of course, greatly changed the picture. Many of the mechanical trades now pay better than the professions. The intelligent choice of a career, however, is based on the long view of what opportunities there are during stable times. An abnormal shortage of skilled mechanics may be followed by a shortage of jobs for skilled mechanics.

### *How to Get a Job*

**N**O MATTER HOW carefully you have studied or how wisely you have chosen your life's work, you can attain vocational adjustment only if you know how to get a job. When an individual seeks employment with a firm, whether in an executive or clerical capacity, his task is greatly expedited if he follows a few simple rules of salesmanship. Job-getting is merely selling oneself.

#### *✓ Studying yourself*

A good salesman makes it a point to know his product thoroughly. He knows its strong points and its weak points. Your



product is you. Make use of all the means discussed so far in this chapter for finding out what general abilities you have. Know especially what concrete qualities and skills you can offer for the specific job you are applying for.

### *Studying your market*

The good salesman studies the market so that he knows where to look to find customers. Do not waste time calling on employers who are not in the market for help. Every salesman works on the basis of leads. Leads originate from many sources. The more time you spend looking for them, the more numerous they will be. Do not neglect the following sources of leads.

*The newspapers.* Read the help-wanted ads. From these you will learn of definite openings which can be followed up. Read the business sections. There you can learn the general trend in business activities. You can find out which companies or industries are expanding and hence might be supposed to be needing more help. You will save time if you avoid the blind advertisements which do not give the name of the company or describe the nature of the work. An honest employer is usually willing to put his cards on the table. Above all avoid the "quick investment" ads unless you have ready access to expert legal advice.

*Civil Service Bulletins.* Keep on the look-out for city, state, or federal Civil Service examinations. These are usually posted in city halls, state buildings, or post-offices. Take advantage of opportunities to be examined even though you feel that you will not pass. Taking examinations is good practice, and there is always a chance that you will prove to be better than you think you are.

*Friends and acquaintances.* Keep in touch with your friends and acquaintances. One of the values of friendship is that it gives opportunity for mutual aid. Do not be afraid to call on your friends for leads. They might have heard of something which they intended to pass on to you "the next time you met." In the meantime somebody else may beat you to it.

*Employment bureaus.* There are many public employment bureaus. Look in the classified telephone directory and investigate the kind of service they give you. Register with several of the higher-grade ones.

### *Showing your product*

Show the prospective employer that you have just what he needs. To do this you must study his organization in advance. He will be favorably impressed to learn that you already know something about his firm. Show him how such knowledge has made you particularly eager to find employment there.

Do not tell the prospective employer how much you need work. The fact that you are applying is sufficient evidence that you wish employment and would take a decent position if it were offered. He may be sympathetic, but his real interest is in finding someone to do a job. Do not apologize for taking his time. It is to his interest as well as to yours to find out whether or not you have what he wants. Tell your story without stuttering or hesitation. Do not promise more than you can deliver, but do not hesitate to emphasize your good points. No applicant ever lost a job through putting his best foot forward.

Dress appropriately for the work. A mechanic might well apply in working clothes. An office worker, by the same token, might well apply as dressed for the office. Girls in particular should remember that the employer is usually looking for workers, not window dressing.

### *Expecting the employer to sell you the job*

If the job is a good one, the employer or employment manager will tell you so. If he does not try to sell you the job, the chances are that it is not a good one. You should feel free to ask questions. You are entitled to honest and courteous answers. The employer who refuses you such attention is probably an inconsiderate one.

You have seen that the college students and high-school students who are capable of doing better school work earn more rapid promotions than those who are not capable. The employer who does not want alert young people should be under suspicion of offering a blind-alley job. Perhaps he is not, but you should make him show you that there are chances to go ahead on the basis of industry and ability.

By studying yourself and your opportunities you can greatly increase your effectiveness in job-seeking.

## *The Psychology of Selecting Men*

EMPLOYMENT PSYCHOLOGY and vocational guidance are very much alike. Both are concerned with the adjustment between the individual and his work. Both make use of the same tests, interviews, and rating-scale techniques in appraising the psychological makeup of the individual. The only difference between employment psychology and vocational guidance is one of emphasis. In our discussion so far we have seen that vocational guidance is interested in the problem primarily from the point of view of the individual trying to find a job; now we shall see that employment psychology takes up the problem from the point of view of the employer. In vocational guidance the attempt is to find the best job for the man. In employment psychology the emphasis is on finding the best man available for the job. Fortunately the best man for the job is usually a man for whom that job is best.

### *Importance of proper selection of employees*

The cost of improper selection of workers is borne both by the employer and the worker himself. If a man is hired for a type of work that does not arouse interest and enthusiasm, that does not provide associates who are congenial and surroundings that are pleasant, the net result will be a dissatisfaction which will soon become apparent. Or if the employer does not take the trouble to hire a man likely to be efficient on the job for which he is hired, the worker himself will eventually discover that he is not able to perform as well as his fellows and will become discouraged, ultimately seeking transfer or quitting outright. Otherwise his employer will probably notice the poor quality of his work and discharge him.

Rate of labor turnover is one of the best measures of efficiency in selecting men. Table 49 shows the monthly labor turnover per 100 employees in 16 industries. Separation rate means the number of individuals in each hundred employed who quit voluntarily, were discharged by the employer, or laid off. Accession means the hiring of a new employee or the re-hiring of an old one. The figures shown in Table 49 give a picture of labor turnover during moderately normal times. Labor turnover is influenced by many

TABLE 49: *Monthly Labor-Turnover Rates (per 100 Employees) in Sixteen Industries*

| TYPE OF INDUSTRY              | SEPARATION RATE |          | ACCESSION RATE |          |
|-------------------------------|-----------------|----------|----------------|----------|
|                               | Jan. '36        | Jan. '37 | Jan. '36       | Jan. '37 |
| Automobiles and bodies        | 5.91            | 6.90     | 2.34           | 3.63     |
| Automobile parts              | 7.96            | 7.69     | 3.61           | 5.90     |
| Boots and shoes               | 1.95            | 2.74     | 4.08           | 6.29     |
| Bricks                        | 6.70            | 5.96     | 5.18           | 5.82     |
| Cigars and cigarettes         | 4.95            | 6.19     | 15.40          | 5.96     |
| Cotton manufacturing          | 3.32            | 2.88     | 3.77           | 4.67     |
| Electrical machinery          | 3.74            | 3.82     | 2.95           | 4.80     |
| Foundries and machine shops   | 3.44            | 2.60     | 3.65           | 6.26     |
| Furniture                     | 4.77            | 3.37     | 5.28           | 5.50     |
| Hardware                      | 3.59            | 3.26     | 2.07           | 6.12     |
| Iron and steel                | 2.24            | 3.21     | 1.87           | 3.55     |
| Men's clothing                | 2.38            | 2.95     | 6.82           | 5.88     |
| Petroleum refining            | 3.55            | 1.54     | 3.70           | 3.16     |
| Rubber tires                  | 1.58            | .88      | 2.04           | 1.36     |
| Sawmills                      | 5.64            | 7.29     | 8.33           | 8.37     |
| Slaughtering and meat packing | 6.97            | 7.92     | 10.71          | 9.36     |

factors, among which, of course, is the seasonal nature of certain kinds of work.

When the rate of turnover is higher in a particular plant than it is for the industry as a whole, the chances are strong that something is amiss in that plant. Perhaps the hiring is not being done efficiently; perhaps the difficulty lies elsewhere. The New York Mayor's Commission on Taxicabs reported in 1930 an annual labor turnover of 460 per cent in that occupation. This is almost 40 per cent per month. This high turnover means that it was necessary to hire more than 18,000 drivers each year to maintain a force of 3,924 drivers at any one time.

Excessive labor turnover is costly. One employment manager gives the following figures of the cost of hiring and training employees:

|                                                                                    |          |
|------------------------------------------------------------------------------------|----------|
| Worker with no previous experience whatever . . . . .                              | \$239.00 |
| Semi-skilled worker with no knowledge of the job to which he is assigned . . . . . | 190.00   |
| Old employee rehired or worker transferred from other similar factories . . . . .  | 24.00    |

The cost of hiring and training, of course, is much greater than that borne by the employment office alone. The new employee is likely to damage equipment, to waste material, or to suffer serious and costly accidents. His production record at the outset will be poorer than that of the worker with a long period of employment behind him. Obviously, labor turnover is something that the employer, as well as the employee, would like to see kept at a low figure.

Although labor turnover is the most obvious and easily demonstrated indication of inefficient adjustment of the personnel to their work, there are many other ways of measuring this lack of adjustment. If, for example, the number of men asking to be transferred to other departments is large, inefficient hiring methods may well be to blame, although other important elements in the situation are apt to enter in here too. Wherever workers are maladjusted and dissatisfied, part of the trouble is probably inefficient selection methods.

### *Selection of employees without the use of tests*

Despite the rapid advances in the field of psychological testing as applied to the selection of employees in business and industry, the most frequently used method of employing still remains the personal interview, augmented frequently by letters of application and letters of recommendation. It is not necessary to review the advantages and limitations of the personal interview as a means of hiring men. That has been done in Chapter 12.

1 *Letters of application.* The letter of application has practically no value as a means of judging the fitness of an individual for a particular task. Perhaps its most serious limitation is the fact that the prospective employer has no reasonable assurance that it was actually written by the applicant. Moreover, such a letter is often very general with regard to the applicant's capacity to do the work required, although a complete and accurate record of the applicant's past employment is usually enclosed.

2 *Letters of recommendation.* According to a recent survey, about 82 per cent of employment offices still require a list of references from non-relatives of the applicant who know something of his past life or work history. These references are usually

of two kinds: (a) those concerned with the actual work record of the applicant; and (b) those concerned with character and personality traits of the applicant. Naturally, previous employers, particularly the employers under whom the applicant was working last, are asked to write letters of recommendation.

Letters of recommendation come to the employment office in at least three different ways: (a) with the applicant who has asked his employer or employers to write to a prospective employer or "to whom it may concern." This type of recommendation letter, carried by the applicant himself, even though in a sealed envelope, usually includes only a short statement that the employee has been satisfactory and is leaving of his own choice or because work is slack or because of some reorganization which does not reflect upon the applicant. (b) The past employer writes a letter to the prospective employer at the request of the applicant. This type of letter is usually confidential but as a rule is not particularly analytic and descriptive of the applicant's ability, since the former employer probably does not know just what kind of work the prospective employer wants done. (c) The prospective employer asks the past employer to answer certain specific questions relative to the work record, character, and personality traits of the employee. This type of letter can have real value if the prospective employer knows what to ask and if the past employer will take the pains to answer the questions carefully.

Letters of recommendation, regardless of their form, have certain limitations which greatly impair their value as a means of hiring. The past employer is not an unprejudiced source of information concerning an employee. It sometimes happens that the employer of a worker whose record is not altogether satisfactory will jump at the chance of getting rid of him. Upon receipt of a request from a prospective employer concerning the individual's work record and other pertinent details, the present employer "lays it on thick" in the hope that the prospective employer will be so impressed that he will take the problem case off his hands. This prejudice can operate in the other direction and to the disadvantage of the employee. Sometimes it happens that a very able worker becomes dissatisfied through lack of promotion, low pay, or some other characteristic of his job. The employer might

not at the moment be in a position to correct the difficulty and yet might be highly desirous of retaining a valuable employee. Consequently, when the prospective employer writes for information, or when the applicant tells his present employer that he is looking for work elsewhere, the present employer will "damn the employee with faint praise" and in several ways intimate that he is inefficient, hard to get along with, and thus prejudice the employee's chances of success in applying for work elsewhere.

Another weakness of the letter of recommendation is that it is usually written by an influential, and therefore busy, person. He is frequently too busy to dig out the record necessary to an accurate reporting of the applicant's performance on the job. In addition he may almost have forgotten about some individual who has worked for him several years ago. At any rate, he usually loses interest once an employee has separated himself from the firm.

In these days of mass education and large university classes, the college professor sometimes does not have the time or facilities to follow the development of each of his students. Let us take a typical case in which a professor may have as many as one thousand different students in his lecture section of Elementary Psychology in one year's time. Although such professors are frequently called upon to write letters of recommendation because of the prestige of their position, the conscientious man must frequently refuse on the grounds that he does not have adequate information available. Sometimes he does not have stenographic help; under those circumstances the labor of writing hundreds of letters of recommendation himself in longhand is too much to undertake. Many universities are meeting this situation by organizing a students' personnel bureau, which is a central clearing house for all information concerning the student's history in school. Summaries of his class marks are kept; records of any psychological tests; records of student-body activities; and even a statement concerning any disciplinary trouble the student might have had while in college, such as cheating in examinations or plagiarizing the work of others in term papers and other reports. A system of this sort can be extremely effective when put in the charge of a psychologist with special training in personnel methods. A personnel bureau has two functions: to give vocational guidance and to find jobs.



*The photograph.* Many employers still insist that applicants supply their photographs. The photograph has some value perhaps, in that it, like the fingerprint, identifies the owner and saves embarrassment for the employer or employment manager who happens to have a poor memory for names and faces. It might even reveal physical disfigurement. Beyond these uses, however, the photograph has no value. As you have already seen in Chapter 12, it is impossible to judge character or personality or intelligence from a photograph.

Landis and Phelps went through the autobiographical sketches of the graduates of a large university published in connection with a class reunion.<sup>8</sup> The alumni publication contained in addition to the biographical material two photographs of each individual, one taken at the time of graduation and the other at the time of the class reunion twenty-five years later. From the autobiographies, which set forth in minute detail the various accomplishments of each alumnus, it was possible to select five successful and five unsuccessful men in each of the professions of law, medicine, education, and engineering. Viteles and Smith projected these photographs on a screen before judges, who were asked to pick out the successful and the unsuccessful.<sup>9</sup> Two groups of judges were used, college students and trained personnel workers. By chance the judges would be right in their choices about one-half of the time. Table 50 shows that they did no better than chance.

TABLE 50: *Correct Judgments Made by Personnel Workers and College Students of the Success or Failure of Ten Men as Revealed in Photographs of Their Faces*

| JUDGES            | PER CENT OF YOUNG<br>JUDGED CORRECTLY | PER CENT OF MIDDLE-<br>AGED JUDGED CORRECTLY |
|-------------------|---------------------------------------|----------------------------------------------|
| College students  | 47.3                                  | 51.3                                         |
| Personnel workers | 52.2                                  | 52.8                                         |

Even trained personnel workers, despite their daily contacts with applicants for employment, cannot accurately judge successfulness and unsuccessfulness on the basis of a photograph. Their belief that they can merely reflects an uncritical way of thinking. Such individuals have never followed their judgments through to see how well they turn out.

### *Psychological tests for hiring*

During the past twenty years numerous industrial organizations have proved to their own satisfaction that psychological tests in the hands of an expert, trained in their use, can contribute enormously to the efficiency of management. For example, the Philadelphia Electric Company reports a 90 per cent decrease in operating mistakes since using psychological tests in the selection of substation operators. Not only were mistakes reduced, but there was a noticeable improvement of morale of employees hired on the basis of psychological tests. The Scoville Manufacturing Company developed a test for selecting apprentices which required only thirty minutes per person but which accomplished what had previously required a year of "weeding-out." The Milwaukee Electric Railway and Light Company reduced the percentage of motormen discharged because of accidents from 14.1 per cent to .06 per cent by hiring men on the basis of a battery of psychological tests. The United States Civil Service found in one study that 93 per cent of the appointees selected by psychological tests were more efficient than average employees selected by other means. These examples drawn from widely different types of work, including both governmental agencies and private enterprise, leave no doubt that desirable results can be accomplished through the application of psychological tests to the problem of selecting employees.

Once the need for improved methods of hiring has been established in a firm, several important steps must be taken in building up an adequate program of psychological testing. The industrial psychologist specializing in problems of selecting employees operates under a sort of "show me" philosophy. Before using, or advocating the use of, a psychological test, he takes great pains to convince himself that the test will really differentiate between good workers and poor workers. This procedure includes five important steps: (1) careful study of the occupation; (2) selection of tests to be tried out; (3) testing the tests; (4) cutting out overlapping tests; (5) weighting the tests; (6) final verification and adjustment.

*Careful study of the occupation.* The industrial psychologist makes a careful study of all production records available for the job in question. He usually finds, however, that it is necessary to

spend several days observing good and poor workers on the job. He makes an especial effort to note any small differences making for superior work among the individuals engaged at the task.

*Selection of tests for tryout.* Once the psychologist has a clear idea of the type of ability called for by the job he is studying, he turns to the psychological literature to study the experience of other psychologists in selecting employees for the same or similar types of work. Sometimes he discovers that very few successful attempts to select individuals in that particular line of work have been reported in the literature. In this case he must use his ingenuity and inventiveness to develop a test which would appear to measure abilities related to successful performance. He never, however, trusts his own judgment completely. The well-trained psychologist insists on testing the tests before putting them to work. Otherwise he cannot know whether the test will actually differentiate the desirable applicants from the undesirable ones on the basis of qualities really needed in the job.

*Testing the tests.* Thus the next step in building a battery of psychological tests for selection of workers is undertaken to answer the question: Does each of these tests really pick out the successful workers from among the unsuccessful? The simplest means of accomplishing this aim is to study the past performance of a group of employees already on the job. A group of outstandingly successful individuals and one of outstandingly unsuccessful individuals are picked out. The employee is not informed of the group to which he belongs. Each of the tests on trial is then administered to the members of each of these groups. If it is found, for example, that tests A, B, D, and G show much higher scores for the successful group than for the unsuccessful group, the chances are that tests A, B, D, and G are measuring something in the individual that is essential to success on the job. Tests which show no average difference between the successful and unsuccessful workers are discarded.

*Cutting out overlapping tests.* We have discovered from the preceding step that tests A, B, D, and G differentiate between the successful and the less successful workers. Now our problem becomes that of deciding whether or not all four tests are required.

After all it is not good economy to take up the time of either the employer or the applicant to administer tests which add nothing to the contribution of the others already in the battery. In other words, it is quite possible that two of the tests are measuring exactly the same thing and hence that only one of them needs to be given. There are two principles to which each test in a battery of tests must conform. (a) Each must correlate highly with actual performance ratings. That is, each test by itself must serve to separate the good from the poor workers. (b) Each test must show a low correlation with other tests in the battery. In fact, when two tests, each of which differentiates the good from the poor workers, correlate negatively with each other, they make a particularly strong team. High positive correlation of one test with another in its battery indicates considerable overlapping of functions. If the correlation between two tests in a battery is perfect, then only one of them is needed because the two tests are doing the same job, i.e., testing the same ability.

There is a well recognized, but somewhat complicated, statistical procedure for determining the independent contribution of each test. A more laborious procedure, but one which is more easily understood by the beginning student, consists of a systematic trial-and-error procedure. Let us say that seven tests which we shall call A, B, C, D, E, F, G have been tried out and that we have found that tests A, B, D, and G taken singly differentiate between the good and poor employees. Let us say that only 10 per cent of the poor workers attain the average score of the successful group on test A. The corresponding figures for tests B, D, and G will be assumed to be 5 per cent, 25 per cent, and 15 per cent, respectively. Obviously, test B alone is better than A, D, or G, because only 5 per cent of the poor workers received test B scores equal to, or better than, the average test B score of the successful group. Our problem boils down to finding out whether three of these tests or perhaps only two, properly combined, will give a total score range which separates the good from the poor as well as do the four of them, all given together. In fact, it is theoretically possible that one test alone would do the job as well as all four together.

The four tests, A, B, D, and G, can be taken singly or combined

in fifteen different ways as follows: ABDG; AB; AD; AG; ABD; ABG; ADG; A; BDG; BD; BG; B; DG; D; and G. For each of these fifteen combinations the amount of overlapping in the scores of the unsuccessful and successful groups of workers is determined. The combination, whether it be all four, any three, any two, or any one of the tests, which differentiates the two groups best are retained, and the test or tests which do not contribute are dismissed from further consideration.

*Weighting the tests.* One more step remains to be carried out. Up to this point the weight given the test scores has been equal. It is quite possible that more accurate differentiation of the successful from the unsuccessful group could be achieved if certain tests were given more weight and certain other tests given less weight in determining the combined scores for the battery as a whole. This procedure is essentially similar to the one described above. Several different weights are tried for each test which has survived. For example, one weight might be the actual test score. Another might be arrived at by multiplying by two, and the third might be obtained by dividing by two. Each weighting of the test would be analyzed in the manner described above, to find which combination of weighted tests will differentiate the two groups most clearly. This procedure is extremely cumbersome and laborious and gives only approximate weights. The specialist, however, would get the precise answer through the application of a statistical procedure called *multiple correlation*, which is too complex to be described here.

*Final verification and adjustments.* The procedure as outlined to this point has one drawback. It sometimes happens that the very tests which, when properly weighted, differentiate the successful from the unsuccessful workers are tests influenced by practice effects. That is to say, the test is of such a nature that the experience the worker has on the job causes him to get a high score on the test. This seriously limits the usefulness of the tests, since the ultimate aim of a battery of tests is to pick out individuals who have had no experience or training on the job but who will eventually become successful workers as a result of training.

The final step, then, in building a battery of tests for selection

consists in hiring a naïve, inexperienced group of individuals, administering the test to them at the time of application and employment, then waiting until their training period is over to divide them into groups of successful and unsuccessful workers. When it has become evident that each worker has reached his maximum degree of skill—this may be a matter of years—the individual tests in the total battery are re-weighted and recombined.

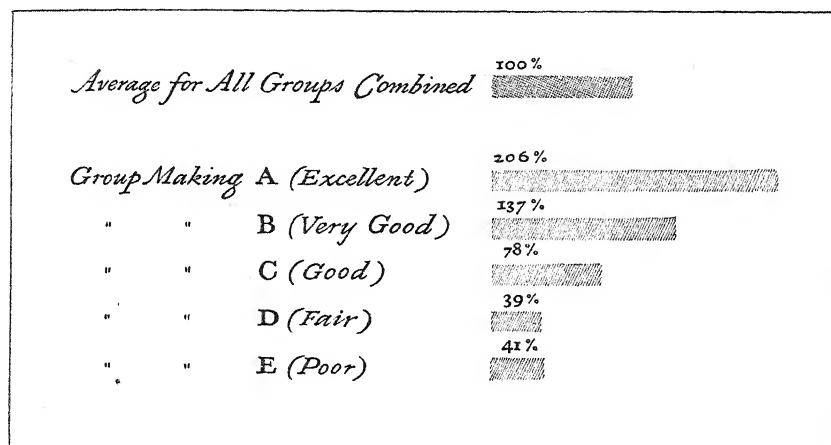


FIGURE 69. First year's sales of insurance agents in relation to scores on an aptitude test. (From Kurtz.)

*Some typical results.* Hundreds of progressive business and industrial organizations have psychological staffs charged with the preparation of test batteries for selecting employees. Because of obvious competitive advantage to the concern who selects its employees efficiently, the specific content of these tests is frequently kept secret. The results as published, however, reveal that test batteries can be constructed which take a great deal of the guesswork out of hiring. Figure 69 shows the relationship between the sales and the aptitude-test scores of a large group of young life-insurance salesmen.<sup>10</sup> For example, those who received an A rating on the aptitude test sold over twice as much insurance in their first year as did the average of the group, whereas those individuals receiving an E rating sold less than half as much. The individuals

rating A sold five times as much insurance as the individuals falling in the E group.

### *The standardized application blank*

In recent years the practice of using a standardized application blank has become prevalent. Many application blanks, unfortunately, are limited in their usefulness as a means of employing because the items contained in them have been arrived at by a process of slow growth in which hunch and inspiration have been more important than careful analytical study. All too often the questions in the application form reflect some misconception of a bygone employment manager or other executive whose name may even have been forgotten.

It is possible, however, to subject each item in the application blank to a rigid analysis of the type outlined above in connection with batteries of tests. In the case of the application blank, each item may be regarded as a test. The problem then becomes: Does a particular item actually differentiate the successful worker from the unsuccessful one?

Let us take a typical study of the predictive value of items in an application blank. Russell and Cope studied the records of five hundred life-insurance salesmen.<sup>11, 12</sup> When they found that a certain answer to a particular item was given more frequently by the successful than by the unsuccessful salesmen, that item was given a positive weight. When they found that an item was answered in a certain way more often by the unsuccessful than by the successful salesmen, that answer was given a negative weight. It was thus possible to assign weights to each answer for each item in the application blank—weights which would indicate the probability of success.

The correlation between the total score for each salesman, arrived at by combining the various items in the blank, and the amount of insurance actually sold was so high that further research was done to improve the value of their application blank as a means of hiring. Success was defined as the amount of insurance sold during a beginner's first year and the persistency of each man in his work as measured by the number of years he stayed with the company. The following items which are frequently in-



cluded in application blanks had high value in selecting successful insurance salesmen.

(a) Marital status. It was found that married men make better life-insurance salesmen than unmarried men of the same age. The married man with a few children is a better salesman of insurance than the married man with no children. (b) Education was found to be an important factor. (c) The higher the applicant's previous income, the more likely he was to become a successful insurance salesman. (d) The more insurance the individual carried himself, the more likely he was to be successful as a life-insurance salesman. (e) Previous occupation bore an important relationship to success as a salesman. Men with previous selling experience were more successful than men whose previous experience had been in other lines. (f) Length of residence in the community was found to be related to success in selling insurance. (g) Membership in organizations such as lodges, fraternities, and so on goes with success in selling insurance.

The Life Insurance Sales Research Bureau has developed a method of weighting items of the application blank to predict the future performance of insurance salesmen. It was found that individuals who get an A rating sell three times as much insurance in their first two years as individuals who receive an E rating.

The application blank can be a very important phase of the hiring procedure, but for best results it must be carefully analyzed, and each answer to each item must be weighted in proportion to its ability to discriminate the successful from the unsuccessful applicant. This can be done only by research and statistical analysis.

Alert management today is taking advantage of all of the statistical devices for selection of its employees. The efficiently organized personnel or employment office is geared to employ psychological tests and weighted application blanks, as well as the personal interview. Where this is done, the desirable procedure is to use the psychological test and the application blank first to make a preliminary selection. The survivors of the preliminary selection are then interviewed by a well-trained personnel interviewer. By rejecting eighty to ninety in every hundred applicants on the basis of the psychological test and application blank, administered by a clerk and scored by a clerk, the more valuable time of the interviewer

is saved for really effective personal interviewing of the ten or twenty per cent likely to be of use.

## *Psychology and Industrial Unrest*

THE NOTION that poor pay and long hours are the only causes of industrial unrest is psychologically unsound. Wages-and-hours disputes have been given undue prominence in newspaper reports of industrial conflict and in the minds of the workers themselves. This is only natural. Many employees are emotionally inarticulate. They have vague, unanalyzed discontents. They know something is wrong, but they don't know quite what it is. Since wages and hours are definite, objective things, easily understood even by the less intelligent workers, their discontent takes the external form of demands for shorter hours and higher wages.

### *Causes of job dissatisfaction*

Although part of labor unrest is directly traceable to economic factors, there is also an important psychological side, which must not be neglected in any attempt at a complete account. Employees show signs of low morale when their work does not give them the satisfaction they require. This dissatisfaction results in much tardiness, absenteeism, "back talk" to supervisors, poor production, and undue spoilage. When dissatisfaction becomes excessive, it may manifest itself in sabotage, strikes, and walk-outs, and even in personal violence to officers and agents of the company or to strike-breakers.

*Failure to understand the worker.* Employers with the best of intentions sometimes have labor trouble even though the wages they pay are fair and the hours not excessive. Dissatisfaction of the employees in cases of this sort is frequently traceable to the employer's lack of understanding of the employee as a human being. This lack of understanding is brought out very clearly in a study reported by Fosdick to the 1939 Convention of the National Retail Dry Goods Association.<sup>13</sup> Several hundred employers and 3000 employees scattered throughout the United States were asked to rate the importance of eight morale factors. The results are summarized in Table 51.

TABLE 51: *Rank Assigned Various Factors in Morale by Employers and Employees*

| MORALE ITEM                           | EMPLOYEE<br>RANKING | EMPLOYER<br>RANKING |
|---------------------------------------|---------------------|---------------------|
| Credit for all work done.....         | 1                   | 7                   |
| Interesting work.....                 | 2                   | 3                   |
| Fair pay.....                         | 3                   | 1                   |
| Understanding and appreciation.....   | 4                   | 5                   |
| Counsel on personal problems.....     | 5                   | 8                   |
| Promotion on merit.....               | 6                   | 4                   |
| Good physical working conditions..... | 7                   | 6                   |
| Job security.....                     | 8                   | 2                   |

Notice that the employees as a group considered credit for work done to be of paramount importance, whereas the employers ranked it as seventh in the group of eight items. On the other hand, the employers assigned the next to the top rank to job security, while the employees put it eighth in the order of importance. This study strongly suggests that the employer is frequently out of touch with the real problems and aspirations of his employees.

*The rewards of work.* The notion that money paid as salaries or wages or earned as profits or commissions is the common denominator of all human aspiration is no longer accepted by students of human nature.

After your study of Chapters 3 and 9, you are quite prepared to accept the propositions that praise is better than blame, that we all work for self and social approval, and that the effective leader of men is the one who understands these human motives.

A. Money vs. self-respect. Many rewards for which men will work to the maximum of their ability are entirely non-financial in nature. Among these can be mentioned the deep-seated desire common to all for a feeling of personal worth, that is, the desire for social approval and self-respect. Mr. Schwab of the Bethlehem Steel Company recognized this fact when he said: "There is nothing that so kills the ambition of a man as adverse criticism from his superior. . . . If a man does a good job, I do not hesitate to tell him; if he does a poor one, I prefer to remain silent. . . . When I see good in other people's work, I do not hesitate to mention it. A little bit of praise affects the sweating puddler as it does the President of the United States."<sup>14</sup>

Walter Dill Scott, now President Emeritus of Northwestern University, has reported an experience showing the rôle of self-respect in determining the behavior of a group of employees in a labor dispute.<sup>15</sup> At a certain time the workers in the men's clothing industry in Chicago were discontented because of various conditions in that industry. To reduce this discontent, most of the employers announced pay increases of ten per cent. Company X, however, did not increase wages, but posted a notice on the bulletin-board promising a "special extra pay envelope" to all workers who would remain loyal until a certain date, after which the rate would be raised. This offer failed to change the attitude of the workers. A few weeks after the notice was posted, the president of Company X bought \$34,000 worth of Liberty Bonds, which were distributed among the workers. The workers still showed no appreciation of the gift. When the special pay bonus was given, the workers expressed active discontent. The president was so completely unable to understand this situation that he called in a local labor leader and also requested the services of Dr. Scott as a consulting psychologist. The following conversation took place.

*President X:* "I can't understand the lack of appreciation of my men. I gave them \$34,000 worth of Liberty Bonds and a special extra pay envelope of a full week's wages. The union agreement has now put all the firms on an equal wage basis. Although I did not increase wages 10 per cent for the period preceding the union agreement, I have given my men more than any other company by the extra pay envelope and the Liberty Bonds. I can't see what more they want."

*Labor Leader:* "Yes, Mr. X, you have done all you say, and your people are not contented as the people are at the other houses. They wanted the 10 per cent and felt that they had deserved it."

*President X:* "No, I did not give them the 10 per cent, but I did give the extra pay envelope and the Liberty Bonds, which amounted to much more than the 10 per cent."

*Labor Leader:* "Yes, I have figured it up, and you gave them in extra pay and bonds somewhat over \$10,000 more than they would have received by the increase they asked. But that is not what they wanted. They do not want the gift of the extra pay envelope and of the bonds, but they do want the 10 per cent even if it is less than the extra pay and the bonds. I believe they would be willing to refund the \$34,000 worth of bonds if you would give them the \$24,000 in what they regard as earned wages."

The proposition was presented to the workers and was accepted enthusiastically, even though it entailed a recognized monetary loss of \$10,000. However, it soothed their offended pride and left them happy.

The president had reasoned something like this:

Major Premise: All that wage earners want is more money.

Minor Premise: The extra bonuses and bonds come to more than ten per cent.

Conclusion: Therefore, the workers prefer the bonds and bonuses.

On the other hand, the experienced leader of working people knew his followers. He knew that they were as much influenced by pride and self-respect as they were by money. Mere money was not enough to compensate the workers for the loss of feeling of personal worth which was engendered by the note of charity introduced by their employer's scheme. They wanted the extra money to come as honestly earned wages and not as a tip given to a servant or as alms to a beggar.

B. Other social motives. Further examples of the greater power of other social motives as compared with the urge for money have been found in instances where the bonus system has failed. The bonus system is a device originated to speed up output in a factory by paying the worker so much for each piece completed over a certain number. This method has worked pretty well in the United States, but it has failed quite often in England. In one British munitions factory during the World War an attempt was made to speed up production by adding the wage incentive to the usual drives. Accordingly, a plan was announced whereby a certain rate would be paid for each unit. The man who did the most work would get the most pay. Before the plan was started, there were considerable individual differences in output. You might expect the incentive to widen individual differences; instead it reduced them to about the average output of the past. One man now did no more than another each day. Moreover, whereas before the plan was put into effect each worker's output varied from day to day, he now did exactly the same amount of work every day. There were now no good and no bad days. Why did this plan fail? It failed because it did not recognize a fundamental thing about human motivation. The workers knew each other. They lived in

the same neighborhood. They dropped in after hours at the same "pubs." They were friends. When the new plan was announced, their attention was focused on the significance of their output, upon the possibility that a slow-working friend would be discharged. Consequently they "stereotyped" their output. If this reasoning is valid, it means that the faster workers actually passed up the greater earnings, because friendship was a stronger motive than money.

Of course we cannot deny that the element of self-protection entered into the determination of the attitude of the English munitions workers. Probably they feared that the speed-up might attain such proportions as to demand of them more strength and endurance than they possessed. This, however, was probably a side issue. The main point is that the bonus system has worked better in the United States, where the tradition of individual effort is strong, than it has in England, where the solidarity of class is great.

c. The desire to create. Modern factory work has developed in such a way as to deny men some of the rewards of work which were theirs in an earlier day. The shoemaker and the cabinetmaker of a century ago, for example, took a real interest in craftsmanship. They employed simple tools. Their materials came to them in a decidedly raw state. Working these raw materials into the form of the finished product required a great deal of skill and creative ability. Furthermore, one workman was responsible for the creation of the entire unit; thus he had the pleasure of seeing the completed product grow before his eyes day by day or hour by hour. The craftsman had few customers, but he served them well. His advertising was mainly word-of-mouth accounts passed on by pleased purchasers of his product. These earlier craftsmen had the pleasure of creating.

Contrast this state of affairs with that of the worker in the modern conveyORIZED factory. Industry today is highly specialized. One man performs a few simple operations hour after hour, day in and day out, weeks and months upon end. Sometimes he never sees the completed product unless he makes a special effort to do so after working hours. His materials come to him on an endless belt, which does not even stop as he performs his simple operation

just in time for the operation of the workman at the next station, and, of course, just in time to commence the same operation on the next unit. Work, under such conditions, has little intrinsic interest. Individuals who are mentally active soon become stifled with the simple tasks of the assembly line. The pleasure of creating is denied them.

*The effects of monotony.* Doing the same piece of work over and over again results, of course, in monotony. The essential characteristic of monotonous work is the unpleasant feeling of boredom and restlessness which it produces in the individual. As the hours pass, this feeling of restlessness develops into one of tension and strain. The worker wants to quit, but he knows that quitting is impossible. He has a family to support. He has no money saved; so he determines to keep at his work. Frustrated in his desire to quit and seek more interesting work, he searches for an explanation of his plight. He reviews grievances large and small. The small ones become large, and the large ones assume gigantic proportions. If left to his own devices, the worker's discontent will often be expressed in the form of complaining or criticizing. If monotony becomes excessive, the slightest excuse for stopping will be seized upon. If no excuse is available, one will be manufactured. The writer has seen workers deliberately jam a machine so that their line would be shut down for repairs.

It is decidedly significant that the automobile industry has suffered from more serious and prolonged strikes than have certain industries in which the rate of pay is considerably poorer. Of course the monotony experienced by the workers in an automobile plant is only one of the many factors entering into this situation, but to a worker who is fed up with the monotony of his work, a strike is an interesting and even glamorous adventure. Like war itself, the strike is an escape.

But the modern factory worker also finds escape in activities other than strikes. His work may be so simple that he can day-dream while at work. One psychologist even observed the case of a working girl who resented being given a new job which paid better but which demanded a more varied type of movement than did her previous post. Her old job had been so simple that she could perform it without conscious attention, leaving her whole



day free for reverie. Such an escape is not a wholesome one. Oftentimes the worker looks to sources other than his own imagination to find pleasant dreams. For such individuals the more lurid films, the burlesque, and the pulp-paper magazines present an avenue of escape to be enjoyed after working hours.

The highly specialized work of the modern factory is not to be compared unfavorably with older methods in all details. Much of the back-breaking lifting of older times has been eliminated. Industrial fatigue seems to be decreasing with the march of time even as boredom increases. In some instances modern factory work is even *less* monotonous than similar work in past generations. The modern operator of a spinning-machine has a more interesting task than that of the colonial woman at the spinning-wheel in her kitchen. The modern dairy farmer finds it less monotonous to place a cow in a milking-machine than to milk that same cow by hand. But in the main the evidence points toward greater monotony in modern industry than in the work of the craftsman.

### ✓ *The cure for industrial unrest*

The principal elements necessary to the development of good morale among workers are, for the most part, ones that can be controlled by intelligent and alert management.

Industrial unrest can be cured by giving the worker a reasonable sense of security in the job, a reasonable amount of personal satis-

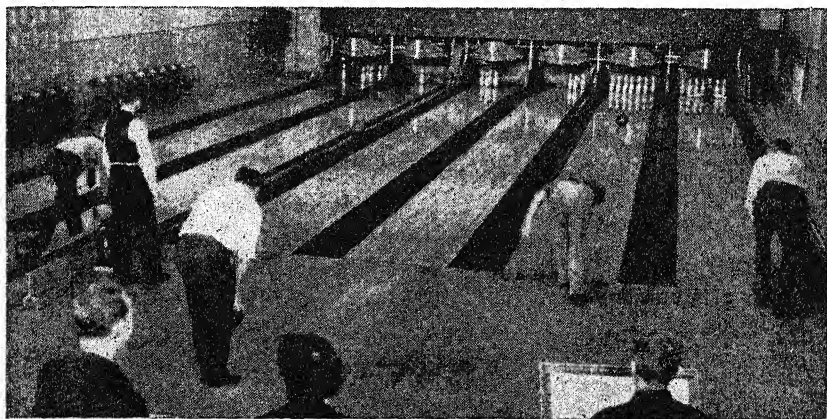


FIGURE 70. Here at the plant of Anaconda Copper Company is evidence of the growing belief that periodic-recreation-for-workers can be important for industrial peace and efficiency.

faction, a feeling that he belongs, that he is participating in the aims and activities of a larger group.

*Overcoming the effects of monotony.* Often the work can be organized in such a way as to appeal to the interest of the worker; if that is not possible, care should be exercised to select individuals who do not object to monotony. There are certain jobs in modern industry which, by their very nature, must be highly repetitive. It is not possible to go back to the horse-and-buggy days of hand-craftsmanship. The engineering advantages of modern mass-production methods and the economic advantages as well cannot be overruled.

It is possible, however, to compensate to a large extent for the lack of intrinsic interest of modern factory work by supplying extrinsic activities. Extrinsic activities are those not necessary to the performance of the task but essential to the physical and psychological well-being of the worker. The Machine Age which has added to the monotony of work also has made it possible to shorten the working day from twelve hours to only seven, allowing the worker much more leisure time for recreation and self-improvement. Industrial psychologists have found that rest periods during the day and recreation after hours serve to break the monotony and, if well-planned, actually increase production for the day as a whole.

Monotonous work can also be made much more interesting by giving it meaning, by showing how a simple repetitive operation is related to the whole exciting process of manufacturing the finished product. To meet a common grievance among modern factory workers—that “All of us work on parts of things. We never see the complete product put together”—the management of one large company evolved the following plan. It was decided to have an “open house.” For two weeks the hours of the working day for key workers in the departments were changed to shifts starting at 2:15 in the afternoon and 11 o'clock at night. After the regular working day was over, the rest of the employees were invited to pass through the factory—to explore corners they had not previously known existed, to witness operations they had never seen before. In this way they were able to get a good idea of the total process of manufacturing their product. But the idea grew far beyond this small beginning. The workmen asked permission to

bring their wives and families with them to see what sort of place "Pete worked in," what kind of job "Joe had." The permanent effect of the "open house" was a noticeable improvement in morale, so noticeable, in fact, that the management has decided to make "open house" a permanent feature.

When an "open house" of this sort is not possible, motion pictures can be used as a substitute for first-hand experience.

*Bettering employer-employee relationships.* Students of industrial relations and personnel management have developed certain rules for the creating and maintaining of better relationships between employer and employee, and for preventing and curing industrial unrest before it reaches the violent stage of sabotage and strikes. (1) Tell the employee as honestly and as accurately as you can as much about the company for which he is working as he can reasonably be expected to understand. (2) Keep rules and regulations at a minimum. (3) Delegate authority and responsibility specifically to each individual. (4) Tell the worker just what his job is to be before he is employed and explain each daily task that is unfamiliar. (5) Use written orders whenever possible, and when orders must be given by word of mouth, have the worker repeat them to be sure that they are understood. (6) Recognize the value of the worker's efforts not only by pay increases but by promotion, honor rolls, and the like. (7) Let the workers know just where they stand and what progress they are making. (8) Establish the merit system in some form. Nothing is quite so destructive to morale as a system where favoritism and family influence are more important than real ability in winning promotion. (9) Apply penalties and criticisms calmly and without prejudice. (10) Develop channels of expression for grievances. Let the employee know that he has a perfect right to express his grievance and to expect that it will be considered seriously and without prejudice. (11) Support by various indirect means favorable home and community conditions. This requires great tact and understanding. The worker must never feel that the boss is trying to live his life or attempting to snoop and pry into his personal problems and secrets. (12) Promote financial security through regular employment, insurance and savings plans, old-age retirement, and profit-sharing plans. (13) Eliminate industrial accidents.

### *Industrial accidents*

Industrial accidents are costly in money and damaging to morale. These accidents are of two kinds, those which involve the impairment of a machine or the destruction of material and those which involve the destruction or impairment of human beings. It is now generally recognized that machinery is responsible for only a small minority of all the accidents that occur in factories and workshops. Most accidents are due to the human factor and hence are avoidable.

The specific causes of accidents are extremely varied in nature. Among the more important ones are: (1) accident proneness; (2) atmospheric conditions; (3) illuminating conditions; (4) work rate and organization.

*Proneness to accident.* Industrial accidents do not distribute according to chance. That is to say, in any body of workers engaged at the same task certain individuals will be involved in more than their chance share of accidents. Numerous psychological studies in the laboratory and in the factory leave no doubt that certain individuals are prone, or susceptible, to accidents and other individuals are not susceptible. Accordingly, one of the most effective methods of eliminating accident-prone workers is the application of adequately designed psychological tests before employment. These tests must be exhaustive in nature and cover all the human abilities involved in the work under consideration. Tests of eyesight, hearing, motor coordination, emotional stability are all important in this connection.

*Atmospheric conditions.* Poor ventilation is one of the important environmental causes of accidents. One of the most thorough studies of the relation between accident frequency and temperature was made by the Industrial Health Research Board of England.<sup>16</sup> An analysis was made of the accidents occurring to 18,000 underground coal miners and 4,500 surface men working in some ten collieries. A later study, based on groups of miners of approximately half the size, gave the same results. In both studies and with both groups of workers, the number and severity of the accidents showed a marked increase as the temperature rose or fell above or below a certain optimum point. A rise of 18 degrees F.

brought an increase of 80 per cent in the accidents to the surface workers. In the case of the underground miners, a rise of 16 degrees F. brought a 73 per cent increase in the accident rate.

More important than the temperature of the air in the mine or workroom is the cooling capacity of the air, which depends upon its temperature, its humidity, and its motion. Warm air will seem warmer if it is humid. This is because the body depends on evaporation of perspiration from its surface as a cooling device, and since humid air already contains a great deal of water, it will take up additional water from the body more slowly. When you fan yourself on a hot summer day, you do not change the humidity or the temperature of the air you are fanning, but you do accelerate its motion, thus cooling the body by speeding up the process of evaporation and by replacing the layer of warm air immediately surrounding the body with air at room temperature.

Numerous studies have shown that properly ventilated and air-conditioned mines and workrooms make for lower accident rates and for greater production per man. Such improvements are not only humane, but they are good business as well.

*Illumination.* We have many proofs of the beneficial effects of proper lighting in increased production per man and in decreased errors and accidents per unit of work. In one study reported by the Research Department of the General Electric Company, it was found that machine operators increased their production rate by 58 per cent, and at the same time reduced their errors by 69 per cent when adequate illumination was installed.

You are already familiar with the characteristics of good illumination from your study of Chapter 10.

*Rate of production.* The effects of increased production rate upon accuracy of work and accident frequency have been studied by many psychologists in a number of experimental situations and actual factory operations. Although the quick worker tends to be the most accurate when working at his natural pace, he becomes more susceptible to accidents if pushed beyond a certain natural rate of work.

Vernon made a study of the effects of increased production rate on frequency of accidents among the workers in a fuse factory during the World War.<sup>17</sup> Due to the war pressure, the workers in the

munitions factory were pushed up until they had achieved a 25 per cent increase in hourly output of fuses. This 25 per cent increase in production rate was accompanied by a 60 per cent increase in frequency of accidents treated at the hospital or dressing station.

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Vocational guidance, or the process of helping an individual find the work most suitable for him, consists in analyzing the various occupations, measuring the individual, and then selecting the occupation that requires the ability which a given person possesses. The factors to be considered in vocational adjustment include intelligence, personality, interests, special abilities, physique, and opportunity for employment.

Employment psychology is concerned with finding the best man for the job. Rapid advances made in perfecting psychological tests have contributed enormously to the efficiency of management.

There are psychological as well as economic factors underlying industrial unrest. An intelligent management, by offering to its workers a reasonable sense of security and personal satisfaction in a job together with a sense of participating in the aims of a group, can do much to promote good morale.

### *Recommended Readings*

ANDERSON, H. D., and DAVIDSON, P. E. *Occupational Trends in the United States*. Stanford University Press, 1940.

Basic information concerning the composition and changing condition of the working population. A summary of the general occupational trends from 1870 to the present time, with a discussion of major factors affecting such trends.

ARMSTRONG, H. G. *Principles and Practice of Aviation Medicine*. Wood, 1939.

For the air-minded. A treatment of the physiological aspects of flying.

BELL, HOWARD. *Matching Youth and Jobs*. American Council on Education, 1940.

Information about 1,750,000 boys and girls who offer their services as new workers.

BINGHAM, W. VAN DYKE. *Aptitudes and Aptitude Testing*. Harper, 1937.

A comprehensive and detailed study of aptitudes and guidance, including a discussion of those aptitudes necessary for success in various professions.

HALL, P., and LOCKE, H. W. *Incentives and Contentment: A Study Made in a British Factory*. Pitman, 1938.

Studies made chiefly by the interview method, analyzing incentives and "decentives" operating among workers in a typical factory.

HARTMANN, G. W., and NEWCOMB, T. (Editors). *Industrial Conflict: A Psychological Interpretation*. Dryden Press, 1939.

An extremely comprehensive study of almost all of our present industrial morale issues contributed by twenty-six authors, including lawyers, psychiatrists, personnel managers, professional economists.

HORTON, S. P. *An Objective Approach to Group-Influencing Fields*. 2nd Edition, Boston, Human Engineering Laboratory, Inc., 1939.

Results of a testing program showing the special aptitudes needed for success in such fields as advertising and journalism.

PATERSON, D. G., SCHNEIDLER, G., and WILLIAMSON, E. G. *Student Guidance Techniques: A Handbook for Counselors in High Schools and Colleges*. McGraw-Hill, 1938.

A useful manual of psychological tests for vocational guidance and employment. Gives validity, reliability standards, publisher, price, and general description of the best psychological tests.

SUPER, D. E. *Avocational Interest Patterns: A Study in the Psychology of Avocations*. Stanford University Press, 1940.

The author reviews the studies in the field of vocational interest measurements and discusses the value of avocations in vocational guidance.

*Vocational Trends*. Science Research Associates, Chicago.

This magazine will keep you posted on current events in the job market.



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CHAPTER 15

GETTING ALONG  
WITH PEOPLE

*Why you do or do not get along with others, including the wife or husband you will probably have some day.*

MOST OF US like to have friends. A wholesome interest in being sought by our fellows is not one to be ashamed of. The problem of getting along with people is a very intricate one. One way to be liked by our fellows is to conform to the standards and traditions of the society in which we live. There are, however, people whose ideals are so out of line that we do not wish to be liked by them. Our friends are right in demanding that we conform to their standards, but we are equally right in expecting them to conform to our own. Living with people is a complicated business in which we should give in at times and expect the other person to yield occasionally as well. The important thing is balance.

Getting along with people also involves the skill of knowing how to lead people—how to cause them to act in certain ways.

## *Factors Making for Popularity*

**A** HUMAN PERSONALITY is the result of years of growth determined by maturation and learning. We cannot expect easily to change the habits of a lifetime, but we can, if we try, take inventory of ourselves and determine where we are weak and where we are strong. Frequently we can modify our behavior, within limits of course, to make ourselves more likable and thus lay the foundation for friendships now unavailable to us. In this section you will learn some of the things which make people either attractive or unattractive to other people. Many of the traits which make people unlikable can be modified or compensated for with sufficient effort.

### *Traits which make people likable*

To find out why we like one person and not another, Thomas had 676 college men and women list a few persons whom they liked and a few whom they disliked and give the reasons for their liking or disliking those persons.<sup>1</sup> The results were analyzed to show what traits of men cause them to be liked by other men; what traits men like in women; what traits women like in other women; and what traits of men cause them to be liked by women. A few of the more frequently mentioned traits under each of these headings are given below. In reading through these lists you must keep in mind the fact that we do not always know why we like a certain person. However, the traits listed do show some general reasons why we like people and suggest ways in which we could go about making people like us.

*What kind of man do men like?* The four traits most frequently mentioned by men as accounting for their liking for another man were intelligence, cheerfulness, friendliness, and congeniality of interests. It is interesting that intelligence is the only one in this group which cannot be modified through voluntary effort. We can train ourselves to be cheerful or at least to appear cheerful, and we can act in a friendly manner toward the people with whom we associate. We can develop interests which fit in with those of people around us and can induce them to develop interests in some of the things we like to do. Furthermore, if we start out by liking people, they will usually respond by liking us.

*What kind of woman do men like?* The four most frequently listed characteristics accounting for men's liking for women were beauty, intelligence, cheerfulness, and congeniality of interests. Sexual attraction was given fifth place. It would seem that the women are somewhat more limited than the men in possibilities for molding their personalities in the interest of increased popularity with men. Intelligence and beauty, after all, are largely inherited rather than acquired through training as are many personality traits. Much can be accomplished, however, through the development of social skills and through diet, dress, and the skilful use of cosmetics. A woman who is not physically attractive or brilliant mentally can compensate in large degree by developing a cheerful manner and acquiring interests which are congenial with those of men.

*What kind of woman do women like?* The women listed the following traits as causing them to like other women: intelligence, cheerfulness, helpfulness, and loyalty. Except for the troublesome problem of intelligence, these traits can be acquired by women who would like to be popular with other women.

*What kind of man do women like?* The three traits most often given by women in explaining their liking for men were intelligence, consideration, and kindness. Cheerfulness and mannerliness tied for fourth place. Once more we find that most of the important traits in determining popularity can be greatly modified through conscientious attention to them.

It is interesting to note in passing that the students in this study listed more persons as liked than as disliked, although the instructions in each case were to "list a few." We like to be liked, and we also like to like people. Men listed more men than women as liked, and women listed more women than men.

If you wish to eliminate your unpopular personality qualities, you must first know what they are. One way of finding out your strengths and weaknesses is to have some of your friends list on an unsigned sheet of paper the traits which they admire most and least in you. If you put this suggestion into practice, be sure to ask only those persons whose opinions you respect. There is no point in trying to please everybody; to do so is as impossible as it is undesirable.

### *Why people dislike us*

In analyzing the traits of college students causing them to be disliked by people of the same or of the opposite sex, Thomas found again that many of them can be altered or corrected. Among those most often mentioned as causes of dislike were selfishness, deceit, snobbishness, and affectation. All of these are subject to correction when their existence is known to the individual.

Cason collected 21,000 examples of annoyances experienced by 659 people of various ages and of both sexes.<sup>2</sup> Slightly over half of these annoyances were caused by disagreeable and thoughtless habits of other people. In other words, most of the things we do that annoy people could be prevented by maintaining vigilance. The following typical sources of annoyance to others are from Cason's list. Every one is preventable.

A person in an automobile I am driving telling me how to drive.

A person coughing in my face.

A person telling me to hurry when I am already hurrying.

A person continually criticizing something.

A person belching.

A person crowding in front of me instead of waiting his (or her) turn in line.

A person bragging about himself (or herself).

A person being a poor loser in a game.

A person cheating in a game.

A person continually talking about his (or her) illness.

A person being inquisitive about my personal affairs.

A person in conversation with me not paying attention.

A person who is eating at the table criticizing the food.

A hostess repeatedly urging me to take some food that I do not want.

The student should not hastily conclude that effective personality can be won by the simple process of taking inventory of and striving to eliminate his annoying habits. Such procedures are helpful if carried out intelligently, but they will not carry the entire load. Many of the things about us which make people dislike us result from conditions which we can control only with the help

of another person who has an expert's insight into the sources of human behavior.

### ✓ *How to break an annoying habit*

The habits of a lifetime are not easily shaken off, but we can rid ourselves of many of the undesirable ones if we know how—and if we *try*. We retain some annoying habits because we do not know they are annoying; we have others because we do not know how to break them. There are some simple rules for the breaking of habits which anyone who really wishes to can put into effect.

① *Lose a bad habit by putting a good one in its place.* It is hard merely to keep from doing something, but it is often easy to do something else. If a friend tells you that you brag about yourself too much, form the habit of praising others whenever you feel like bragging. Even if you do continue to brag a little, it will not be so noticeable if you sandwich in some praise of the other person.

② *Grasp every opportunity to use the new habit.* Practice makes perfect. Suppose that your friends accuse you of being glum. Seize every opportunity to smile no matter whether you feel like it or not. You will be astonished to see how quickly it becomes easy to smile without even trying. Next you will discover that smiling, even though you do not feel like it, somehow makes you feel better. Do not put it off. If you have a bad habit to get rid of, select a good habit to put in its place and go to work.

③ *Burn your bridges behind you.* If you make it impossible to retreat, you are forced to advance or at least stand still. Tell your friends what you intend to do. Invite them to make fun of you if you fail. A man once wished to stop drinking. He put an announcement in the newspaper offering ten dollars to anyone who could catch him in a saloon.

④ *Permit no exceptions.* Every time you fail you go back nearly to where you started. It is like dropping a ball of yarn that you have been winding up or upsetting a box of tacks that you have just picked off the floor. Don't let yourself fail even once. At any particular moment you are most likely to do what you did last in the same situation.

⑤ *Make use of negative practice.* You will remember from Chapter 9 that Dunlap found a way to cure bad habits by consciously and

deliberately practicing the bad habit while constantly saying to himself, "This is wrong. I will not do it this way again." This method is especially effective with habits that have become fairly automatic and unconscious; as soon as we bring them entirely under voluntary control, we have comparatively little trouble in eliminating them. It is slipping into the bad habit unconsciously and involuntarily that hinders the breaking of the habit and should be discouraged.

✓ *What part do clothes play in popularity?*

Glance back at the list of the things that people do to annoy other people. Notice that clothing is not mentioned. This should help you arrive at an estimate of the proper place of clothing in people's lives.

The idea that your personality is expressed by your selection of clothes is, however, a very old one. It is true that we can tell much about the personality of an individual by careful observation of his clothes. Some of us like to be conspicuous. Such individuals resort to loud and extreme clothes to attract attention.

To be a leader in style, whether extreme or conservative, you must have plenty of money and no less self-assurance. A timid person in an extreme outfit will feel painfully shy and will appear so to others. A college student whose parents are in moderate circumstances cannot afford to make dress a hobby.

Fortunately, however, you are judged by the appropriateness of your clothing more than by its cost. Anyone can acquire the social information necessary to dress appropriately to the occasion. The rich have no advantages over others in this regard.

✓ *The art of conversation*

You have seen that intelligence is one of the traits which men and women admire in their own and in the opposite sex. Your conversation is one basis on which others estimate your intelligence. To have many friends, you must be a good conversationalist. This can be learned if you will set yourself to it. Let us look at some simple devices of the good conversationalist.

① *Having something to say.* It is very hard to be a good conversationalist unless you have some ideas to express in conversation.

We all like new things; new things to eat; new things to wear; new things to hear. The person who comes from a foreign country or from a distant part of your own country has much which may be old to him but is new to tell you. In the same way things which you have done or ideas you have read about make good topics of conversation if they are new to your listener. Not all ideas which are new to your friends need be original with you.

⑦ *Forgetting yourself.* Egotism is a trait that makes people dislike you. Do not talk about yourself the majority of the time. If you must talk about yourself at times, see that what you say is related to the topic and not an attempt to change it. If you are discussing books, or movies, or sports, it is all well and good to add your own opinions as part of the total, but don't expect anyone to take your opinion more seriously than that of another unless you can show that you are especially qualified to talk by virtue of special study or travel.

⑧ *Not being too sure about it.* The clever conversationalist avoids the "know-it-all" air. He does not make dogmatic statements with an air of great finality. If a topic is up for discussion, that fact indicates that the members of the group find it interesting and not yet solved. To give them the answer in a dogmatic way is to suggest that they are not very bright to be in doubt.

⑨ *Not interrupting.* There are a few exceptions to the rule that you should not interrupt when someone else is speaking. There are times when you can make a point clearer, and you may then feel it is good form to interrupt. In general, the more persons in the group, the more reluctant you should be to interrupt. Obviously, each interruption means that you think your opinion more valuable than that of the person who is speaking. Remember that the time to ask questions is after the speaker has stopped.

⑤ *Looking interested; avoiding antagonistic gestures and expressions.* It is possible to interrupt a speaker even though you keep your mouth closed by frowning or looking annoyed by what the speaker is saying. You are entitled to have your say when the proper time comes, but show that you have poise and good manners by waiting for your turn. It is part of politeness to appear interested. It is no fun to talk to a "dead pan." Emotions give us life. Be alive to the other person. Show pleasant emotion.



Looking interested and avoiding antagonistic gestures will go far toward making you interested. Those tactics will help you get the other fellow's point of view. Once you get it, you will not have to suppress antagonistic gestures—you will no longer feel inclined to make them.

Sportsmanship has as much place in the parlor as on the ball field. Learn to lose cheerfully and win modestly. Keep your temper. The loss of it may be taken as a sign that you are losing the argument. We all like to win, and we like to have others know that we are winning. To become angry is the best way there is of giving the impression that your opponent is a better man than you are.

*Watching your words.* Just as your clothes serve to set forth your body in an agreeable way, your words express the quality of your intelligence. You can show bad taste in both. There is no objection to the use of slang if it really says what you want to say. Often it does not. Be especially careful to avoid words which might hurt others' feelings. Many expressions which you use lightly and without thinking are insulting. Such terms as "nigger in the woodpile" offend colored people, because they imply that Negroes are dishonest. Expressions such as "dirty Irish trick," "Jew down," are fundamentally as insulting as terms like "Wop," "Chink," or "Jap."

You will recall that students placed intelligence near the top of the list as a trait causing them to like members of the same or opposite sex. You will also recall from your earlier study of factors limiting the development of intelligence that this trait is determined to a large extent by hereditary factors over which you have no control and by early environment which has already had its effect long before you come to college. Is the situation entirely hopeless, then?

Admitting that it is impossible to raise the actual intelligence as measured by tests, we still have recourse to making the most effective use of the intelligence which we possess. By so doing, we can often improve our intelligence in the eyes of our friends and associates. One of the best ways to do this is to develop facility in expression, both written and spoken. The writer once asked the members of a class in applied psychology to prepare letters of application for a particular scholarship for which they were eli-

gible. Each member of the class read the letters of the others and attempted to estimate the intelligence and certain other traits of the authors. The average estimated intelligence of the writer of each letter was computed by combining the estimates of the fifteen members of the class. These pooled estimates of intelligence were then compared with intelligence-test scores. There was a high degree of correspondence between the two, with one interesting exception. The individual who was next to the lowest in intelligence as measured by the test was found to occupy the third highest position in estimated intelligence. Why this discrepancy? Investigation showed that the overrated person had had several courses in business-letter writing under a very competent instructor. Although the student's work in the letter-writing courses was only mediocre, the benefit had been sufficient to cause her intelligence to be overrated by the majority of the student judges. These results indicate that the student who cultivates the technique of expression through written language can readily improve his intelligence as it is judged by other people.

The simple experiment with the letters of application led to the question whether the quality of spoken language has the same effect on estimates of intelligence. The writer had each member of a class *rate* every other member on intelligence without knowing the intelligence-test scores. Then the members of the class rated each other on the basis of quality of English used. In a class of fifteen there were three individuals who were ranked by the estimates above their *tested* intelligence ranking. In each of these three cases the composite ranking of command of English was also above their intelligence ranking as determined by test. These observations indicate that the individual who uses good English in speaking will be rated as more intelligent than he really is. The correlation between intelligence and the quality of English spoken or written is high enough to impose a limit upon the degree to which we can raise our rated intelligence, a fact which should not, however, discourage the individual from taking as much advantage of the effect as he can.

The findings of the writer's informal experiment were suggested in part by a more formal experiment conducted by Michael and Crawford in which the ability to judge intelligence from the

voice was studied.<sup>3</sup> These workers found that voice qualities, such as inflection, enunciation, force sense, key sense, pitch accuracy, as judged by a trained teacher of public speaking, correlate positively with intelligence as measured by a standard test. Without wholly realizing it we all recognize this relationship between voice and intelligence in our daily contacts with people. The individual who consciously improves his voice qualities will be rated as of higher intelligence than that revealed by tests.

### *The foundations of friendship*

Bogardus and Otto asked 300 students at the University of Southern California to check on a list of items those in which they and their close friends were more alike than different and those in which they and these friends were more different than alike.<sup>4</sup> The items on the check list were the following activities and traits of character or personality: dancing, drinking, smoking, studying, grades, personal standards, lending money, going to football games, going to church, neatness in dress, going shopping, reading fiction, cultural interests, participation in sports, hobbies, club interests, fondness for children, and determination. Similarities between friends were least in reading tastes, hobbies, and grades in class work; similarities were greatest in ideals or moral standards, interest in football, and neatness of dress. From the replies in general it would appear that close friends are more apt to be alike than different. Similar standards and ideals are the fundamental bases of lasting friendships. This is true for both men and women.

Some interesting differences between the sexes were noted, however. Men friends tended to be more similar to each other than did women friends in their liking for participation in sports, in the possession of the trait of determination, and in their habits of church attendance. Similarity with regard to drinking was greater among friends of both groups than was similarity in smoking.

When friends differ in some quality, that quality is one which is admired by the one who lacks it. In this fact we see a subtle compensation for a felt inferiority by identifying oneself with another successful person. It would seem to follow from this study that in establishing a friendship you should look for a person who either resembles you or possesses some trait which you admire but lack.

Friendship was found to be a lasting thing. The average duration of the friendships studied was four years at the time of the study. In this connection it must be remembered that most of the students in the investigation lived in the same city and had known each other in high school. Very few friends had met each other through family contacts.

Cattell conducted a study to discover the traits which were favorable to the beginning and continuation of friendships among a group of English college men.<sup>5</sup> The subjects of the experiment lived together in the college and were well acquainted. Each was asked to name one friend and one enemy. Each subject was also rated by a committee as to the degree of possession of certain well-defined personality and character traits. The friends of extroverts were characteristically extroverted. The friends of men who were rated as conscientious, persistent, energetic, and tactful tended to possess those same traits, whereas their enemies tended to lack them. In the case of the trait of perseveration or single-mindedness friends were either practically identical or completely unlike each other.

The men who were high in the trait of perseveration listed fewer friends and more enemies than those men who were low in that trait. This difference occurred despite the instructions to name but one of each. Cattell's study showed further that the most popular men were moderately extroverted and very low in perseveration. The least popular were very high in extroversion and in perseveration.

In conclusion Cattell suggests that a similar study might be made with married couples in an attempt to develop methods of predicting compatibility in marriage.

### ✓ *Successful Marriage*

THE DEVELOPMENT of sentimentalized love in the individual and the social orientation of love constitute a very complex phase of growth which is extremely subject to deviations from the course of normality, too often giving rise to unrest, inefficiency, and unhappiness, both during the period of growth and subsequently. Our society finds it necessary to impose many restrictions upon the

expression of the sexual drive. The social institution of marriage guides the expression of the biological emotion of sex or lust and its sentimentalized derivative, love. Marriage involves much that is not primarily sexual in nature, but the sexual aspect is so significant in wholesome marriage that a review of the growth and socialization of the sexual drive is not out of place here.

### *How the sexual emotion develops*

The Freudian psychologists trace four well-defined stages in normal sexual development, each of which presents its own peculiar problems and pitfalls.<sup>6</sup> The following discussion includes also the findings of many other psychologists. Knowledge of these significant discoveries is of profound importance in making a major adjustment in life; accordingly, the findings should be accepted in the spirit in which they are presented.

To what extent the latter phases of this picture are to be explained as conditioning to cultural patterns and to what extent they are due to maturation is unknown.

① *The self-love hazard.* In the first phase of sexual development as seen in the young infant the individual learns that self-stimulation can be effected. Freud calls this stage of development "auto-eroticism," or self-love. The self-love behavior of the baby frequently and quite naturally takes the form of manipulation of its genital apparatus. There is nothing physically harmful in these practices, and their occurrence in a child of either sex should cause the mother or father no alarm or feeling of shame. That such practices are frequently punished by parents and nurses is an unfortunate fact of civilized living. Punishment for so natural a practice leads to feelings of fear and guilt which may hamper the normal development of the sexual drive into more socially acceptable channels. In fact, punishing or scolding a child is more likely to delay than to accelerate the outgrowing of the practice of masturbation.

The best treatment of masturbation is to ignore it when it occurs and to try to prevent its occurrence by interesting the child in things apart from his own body. This treatment promotes the early outgrowing of the phase of self-love. The parents who provide interesting toys and activities for their toddling son or daugh-

ter have done much to lay the foundation for a wholesome sex life later on. Punishment is the major hazard of the self-love period.

*The parental pitfall.* In the second phase of its life, coming after the first year, the infant's love is attached to adults or other persons in its immediate environment. The parents, since they are closest, are the natural recipients of this attachment. The intense love of the child of a few years of age for its mother or father is just as natural as the earlier self-love. The parental pitfall is encountered only when the parents in mistaken sentimentality permit this attachment to become too strong or to act in such a manner as to delay the coming of the third phase. The best antidote for excessive parental affection is a varied and interesting world of people and things. Wise parents will provide outlets for the child's affection. Failure to provide diversions may be due to ignorance as to the need for them, or it may represent a more deep-seated lack of adjustment on the part of the parents. Unhappily married parents and widows or widowers must guard against compensating for their own sexual frustrations by fostering in a child too intense a love for themselves. The parental pitfall is a double one. When too much parental love is encouraged, the child may remain permanently attached to the parent with subsequent failure to develop into the next phase of sexual adjustment. On the other hand, too little parental love or a too sudden withdrawal of the parental love may encourage the child to return to the earlier self-love phase. The parent who is in doubt as to the exact point of balance in his or her relations with a child should consult a clinical psychologist or psychiatrist.

In the average child the age of going to school marks a rather sudden liberation from parental domination. The child continues to love his parents, but the love for parents is shared by love for the teacher. If, however, the child has been permitted to form too strong an attachment to the mother, the period of starting in school may be a very trying one indeed. Stuttering, a sign of emotional difficulty, frequently starts at the time the child leaves the close protection of the home and is forced to shift for himself at school. If the first adjustment to school is made satisfactorily, the child has skirted the pitfall of excessive parental love. New in-

terests take up his time. New friends receive a fair share of his affections.

The following case history shows the failure of sexual development to expand beyond the parental-love stage:

Andrew J., an only child, whose father died when Andrew was a young lad, became the chief object of the affections of a dominating and solicitous mother. In youth he gave evidence of fair ability, and in late adolescence he made some overtures toward establishing normal self-dependence. He enlisted during the Spanish-American War, but was promptly brought home by his mother when he developed an illness. Later he married, but his wife soon affirmed that he must choose between her and his mother. He chose his mother, devoted himself to satisfying her affections and whims, and received her motherly care in return. He never realized the promise of his youth in any vocational achievement commensurate with his ability. He became and remained a subordinate clerk in a business office. When he was past fifty years of age, his mother died, and in a letter to a relative at that time he wrote, "I have nothing further to live for. I am just waiting to join mother."<sup>7</sup>

*The homosexual hurdle.* Normally the parental love stage gradually expands to include members of the same sex. The school-boy, busy playing Indians or G-man, has little time to think of girls. His loyalties are all to the other fellows in the "gang" to which he belongs. Little girls are only tolerated or even treated with contempt. They are certainly never welcomed to the playground. This feeling is quite mutual between the sexes during the period just before puberty.

In this third phase of sexuality definite homosexual inclinations may arise. These usually find their expression in intense feelings of loyalty of boys for the members of the gang, violent hero worship, on the part of either sex, and in the "crushes" which pre-adolescent girls have on other girls or upon their women teachers. This period extends into early adolescence and may sometimes bring with it overt sexual practices between members of the same sex. In certain instances the transition from the homosexual phase to the normal adult phase does not occur. The adult homosexual is not unfamiliar on the streets of our towns and cities. Women dressed in men's clothes or affecting extremely mannish fabrics and lines and men who use lip-stick and rouge and walk with



mincing gait are advertising to the world their failure to get over the hurdle of homosexuality. In many large cities of the United States and Europe there are certain restaurants, dance halls, and night clubs which serve as meeting-places for homosexuals. The person who, though remaining in the homosexual phase of development, marries because of social convention is almost certain to be unhappy and to make his or her partner equally unhappy as long as the ill-advised marriage lasts. These are extreme cases. In less extreme cases men just aren't interested in women.

As the child reaches the age of puberty, the balance of power in the endocrine system changes, and the first signs of adult sexuality are sometimes seen in shyness of behavior when members of the opposite sex are around. The changes may also appear at the surface as the silliness and giggling of the girls or as swaggering loudness on the part of the boys.

*The age of romance and marriage.* Two powerful influences are at work in civilized society making for failure of normal and healthy development of the sexual life of many individuals.

Although the psychoanalytic description of normal sexual development can usually be found upon close examination to be applicable to the life of any person who has reached adulthood, it quite naturally gives rise to indignation and disbelief on the part of many people. There is an unfortunate social tradition which regards any mention of sex as bad taste. Fortunately, this influence is rapidly losing force. College students of today face their sexual problems much more frankly than their parents and grandparents did before them.

The other influence, however, is entering into the situation with more and more weight. Notwithstanding the temporary effects of the defense boom, modern standards of professional training are becoming so severe, and economic trends are such, that young people of today must postpone marriage to an age well beyond that of sexual maturity. Emotional frustration inevitably results.

Although late marriages among the middle-class people are almost inevitable for economic reasons, the picture is not, however, entirely dismal. If the frustrated sexual impulses find outlet in enthusiastic preparation for economic maintenance and pro-

fessional training, the consequences may not be too serious. It is, moreover, within the realm of possibility that scholarships and student-loan foundations will eventually be developed to such a degree as to permit early marriage of able young people of limited financial resources. In the meantime, what conflict there is can be considerably alleviated by a sublimation of the sexual drive into socially acceptable channels such as athletics, scholarship, student activities, and related interests.

### *Why marriages fail or succeed*

Getting married imposes a strain unequaled in any other phase of a person's existence on his ability to adjust to changed conditions of living. Marriage and family life, like any other career, involve the close coöperation of two or more persons. Two persons who are poorly suited to each other and consequently unhappy together might each find happiness in some other union. Many of the factors making for marital maladjustment have not yet been identified, but some of them are sufficiently well understood to merit a tentative discussion of their importance.

*Does marriage in haste mean divorce at leisure?* Courtship is an important psychological factor and social institution. During this period, men and women have a chance to become acquainted with each other and to learn to be unselfish in the interests of lasting harmony. What happens when this important period of getting acquainted is cut short? Hamilton, a psychiatrist, studied 100 married men and 100 married women, employing a standardized personal interview.<sup>8</sup> He found that marriages hastily contracted during the hectic war period of 1916 to 1920 were less happy for both the men and the women than those contracted before and after this period.

The result of Hamilton's study is in keeping with government statistics on marriage and divorce for the post-war period. Hall analyzed the United States census records on marriage and divorce for the years following the World War.<sup>9</sup> He found that the marriages in the period immediately following the war were less stable than those of later periods. Two hypotheses were set forth to explain the early post-war instability. The first is that the spirit

of the times was responsible. The general unrest was conducive to foolish promises. Add to this the fact that the experiences of the war itself changed many of the men in temperament, character, and even in physical traits so that they were perhaps less able to make deliberate wise choices (as well as being less suitable for compatible marriages). Mismatings resulted, and an increased divorce rate reflected that fact. The second hypothesis is that the shortness of the engagement period was responsible for the instability of the marriages. The balance of evidence favors the former hypothesis. Terman<sup>10</sup> and Burgess and Cottrell<sup>11</sup> have found that length of the period of courtship has very little effect on happiness in marriage.

*The importance of a fundamentally coöperative attitude.* Marriages sometimes appear to be wrecked by mere details, such as different preferences of room temperature; disagreement as to whether bridge is more important than basketball games; failure to agree on who shall keep the household books; different views on the question of whether a car should be bought on credit; differences of opinion regarding the place of pet animals in the household. Most often, however, these details are but signs of a lack of fundamentally coöperative attitudes between the two life-partners. Marriage, like friendship, is a give-and-take situation in which each participant must be more than willing to do part of the giving.

*Early marriages vs. late ones.* Terman and Bottenwieser made a comprehensive study of the personality factors influencing marital happiness in 100 happily married, 100 unhappily married, and 100 divorced couples.<sup>12</sup> With regard to the time of life at which marriage is contracted, they found that the degree of happiness in marriage showed no correlation with age of either party.

Hamilton, however, found a significant correlation. Hamilton's study disclosed that men and women married before the age of twenty-four years were happy in their marriages at the time of the investigation in about thirty per cent of the cases. Men and women who married between the ages of thirty and thirty-four years were happy in nearly sixty-five per cent of the cases.

Obviously, the problem of age of marrying is a complex one

requiring further study. It may be that the discrepancy between the findings of Terman and Battenwieser and those of Hamilton is due to differences in the selection of the cases studied. The Terman and Battenwieser groups were closer to the average of all people in the United States than were those of Hamilton. Hamilton's subjects were as a group decidedly superior in socioeconomic status. In their case the unhappiness of those married early in life might be the result of thwarted professional ambitions or economic difficulties growing out of the lower earning capacity as a result of interference with advanced study.

*The problem of age discrepancies.* Popular opinion has it that marriages of persons divergent in age are bound to turn out badly. Terman and Battenwieser found that age differences between husband and wife in the groups studied bore no relationship to happiness or unhappiness. Hamilton, however, found them to bear some relationship. There were seven cases (individuals) in Hamilton's groups in which the wife was seven to eleven years younger than the husband. The three husbands and the four wives in this group were all unhappy. According to Hamilton, men are happiest when they are one to three years younger than their wives or of the same age. Women are happiest in marriage when they are the same age as their husbands. Although the results of the two studies are not in close agreement, they do agree in that neither upholds the popular notion that the husband should be three years older than the wife.

*The desire for children.* Terman and Battenwieser found that the desire for children by either spouse taken alone had no relationship to happiness in marriage, but *agreement* between husband and wife in either wanting or not wanting children bore a positive relationship to marital happiness.

*Happily married parents.* Happy marriages seem to run in families according to Terman and Battenwieser. In selecting a mate it is well to inquire into the marital happiness of the prospective mother- and father-in-law.

*Parental attachments.* It has been argued by certain psychologists that strong attachment for the parent of opposite sex will tend to produce unhappiness in marriage. The results of Terman and Battenwieser show that this is untrue on the average. Mem-

bers of the happily married group were more, not less, given to parental attachments than were members of the less happy group. People who are affectionate will love both their parents and their spouses. The selfish, cold person will love neither. It must be remembered, however, that this study was based upon married people and did not include those individuals in the general population whose abnormal parental attachments prevented them from marrying in the first place.

*Emotional stability.* Emotional stability as measured by an emotional trouble inventory showed only a slight correlation with the happiness of that person's wife or husband singly. This finding is also contrary to popular belief.

Apparently a husband or wife can have certain emotional difficulties and still not cause the partner to suffer thereby.

*Agreement and disagreement.* The most promising finding of the Terman-Buttenswieser studies was the discovery of certain things on which the husband and wife should agree and certain things on which they should disagree in order to be happy. The couple should agree on the answers to the following questions in the Bernreuter Personality Inventory.<sup>13</sup>

Does it make you uncomfortable to be "different" or unconventional?

Are you easily discouraged when the opinions of others differ from your own?

Do athletics interest you more than intellectual affairs?

Do you find conversation more helpful in formulating your ideas than reading?

Do you like to bear responsibilities alone?

Do you want someone to be with you when you receive bad news?

Does it bother you to have people watch you at work, even when you do it well?

Do you usually try to avoid arguments?

Do you especially like to have attention from acquaintances when you are ill?

Are you willing to take a chance alone in a situation of doubtful outcome?

If you came late to a meeting, would you rather stand than take a front seat?

Would you "have it out" with a person who spread untrue rumors about you?

- Do you prefer a play to a dance?
- Do you prefer to be alone at times of emotional stress?
- Do you usually prefer to work with others?
- Do you like to be with people a great deal?

To be happy, the couple should disagree on the following questions taken from the same inventory.

- Have you ever crossed the street to avoid meeting some person?
- Are you much affected by the praise or blame of many people?
- Do you usually prefer to do your own planning alone rather than with others?
- Do you find that telling others of your own personal good news is the greatest part of the enjoyment of it?
- Are you thrifty and careful about making loans?
- When you are in low spirits, do you try to find someone to cheer you up?
- Can you usually understand a problem better by studying it out alone than by discussing it with others?

Most of the items in this list obviously measure degrees of introversion-extroversion. You have seen from Cattell's study that friends are usually both introverted or both extroverted. The fact that introverts get along with other introverts and that extroverts get along with other extroverts in marriage is another confirmation of the general principle that successful marriage is a form of permanent friendship.

Kelly has shown that marital compatibility is accompanied by willingness on the part of both the husband and wife to admit the superiority of the spouse.<sup>14</sup> Each party to a successful marriage tends to assume an attitude of humbleness in relation to the partner. This factor is more important for wives than for husbands. The wife in a successful marriage tends to look to the husband for leadership more often than the husband looks to the wife.

### ✓ Predicting compatibility in marriage.

The work of Terman and Bottenwieser and of Kelly is essentially a pioneering effort, but it is sufficiently advanced to suggest that eventually tests of marital adjustment can be built which will predict success in the career of marriage in exactly the same way that success in other vocations is predicted. It is conceivable that

the time will come when reason will guide Cupid. A good test of marriage compatibility will go further than any number of laws in decreasing the divorce rate and in averting the hardships which the maladjustment of parents entails for their growing children.

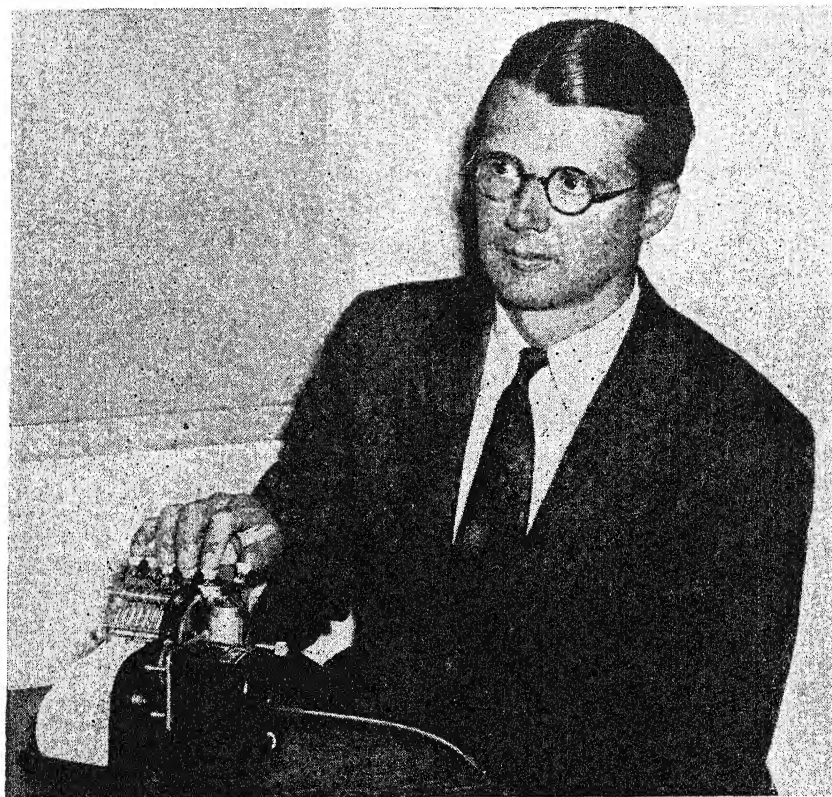


FIGURE 71. *Although the work of Terman and Bottenweiser and of Kelly is a pioneering effort, already the measurement of compatibility has reached the machine stage. Watching from behind a screen a couple unaware of observation, Dr. Ernest Chapple (Harvard) records conversation and gestures on his new machine. The tape record reveals factors necessary for determining personality and predicting compatibility of the subjects.*

There is no good reason to doubt that personality inventories can be built which will even predict in advance the degree of satisfaction to be obtained from motherhood. The human advantages of such prediction are obvious since parenthood is even less reversible than marriage and the children suffer as much as, or more than, the principals in case an incorrect decision is made.



Much experience has shown that maternal "instinct" is not adequate to guide the mother in the care, feeding, and all-round training of her children or indeed in making the fundamental decision as to whether or not she should bring children into the world.

### *Parenthood*

Inevitably there are certain problems which become acute when there are several children in the family. When two children come about three years apart, the older one is fairly well into the phase of parental love at the time the other is born, so that the situation frequently brings with it a certain degree of frustration for the first in his love for his parents, especially the mother. The older child ceases to be the center of attraction. Parents and visitors alike exclaim over the antics of the new baby, while the older child gives vent to his frustrated love in violent outbursts of temper or silently nurses a resentment for the newly arrived rival. Fortunately, such feelings of jealousy are short-lived when parents exercise balance and control in their treatment of both children. The wise parent attempts to appeal to the older child to assume the rôle of protector. By so doing he wins the approval of all by simple acts of generosity toward the younger brother or sister. Failure on the part of the parents to adjust the older child to the presence of a younger one has been known to result in permanent animosities whose subtle or overt manifestations mar the beauty of the family relationship.

Parenthood is an important obligation which carries with it some sacrifice of the liberty and freedom of movement enjoyed by the childless couple. On the other hand, the fact that humanity marches on generation after generation is adequate proof that parenthood, despite the privations that it may incur, is solidly founded in biological and social motivation.

### *Leadership*

THE IMPORTANCE of wise leadership to harmonious human relations is apparent in any kind of group that is trying to work together, since in any group leaders are needed and inevitably

emerge. Political leadership affords possibly the most striking example of the psychology of leadership. Even in intellectual leadership, however, the same principles hold true.

A leader is a person whom people are willing to follow. We can't all be leaders, and fortunately most of us do not want to be. In this section we will see some of the factors contributing to effective leadership.

### *How do leaders emerge?*

The choice of a leader follows the course of any motivated behavior. The series of events in the selection of a leader runs something like this: (1) a need exists; (2) several individuals suggest themselves or are suggested as leaders during a period of conflict and trial and error in which each leader strives to be accepted; (3) "the people's choice" emerges, holding sway until conditions change.

*The need exists.* History shows that a leader usually arises when a need for him exists. It does not follow that the leader who emerges is always the best possible one. Likewise, many a potential leader has failed to develop because he happened to live in a society or at a period when his particular talents were not required. In the realm of world affairs we find excellent examples of the emergence of a leader in time of chaos. The end of the World War found Germany in a badly disorganized condition. People were starving; old ideals of patriotism and loyalty to the Fatherland were shattered by their Emperor's desertion. A bad business depression and consequent unemployment and starvation added to the confusion. Slowly at first and then with rapidly increasing speed a house-painter named Hitler arose as leader. His leadership once achieved has been perpetuated through fear, force, and violence.

*Several tentative leaders are given a trial.* This is the phase of the whole process which is most critical from the standpoint of the would-be leader. During this phase he has an opportunity to employ all the devices of persuasion with which he is familiar. Great leaders grow in popularity as they compete with rival would-be top leaders. The qualities of good leaders are too numerous for minute description, but some deserve special mention.

A. The leader is often a person of impressive physique. Distribution plots for the height of the executives and policy holders of a large insurance company show that the executives are taller on the average than the policy holders, although there is much overlapping. This overlapping shows that tallness is only one factor in the equipment of a leader of people. History has given many exceptions to this rule, especially among military and political leaders.

B. The leader is a man of great energy. He is willing and able to work long hours. He feels that the goals of the leader are highly desirable and will work hard to get them. Franklin Roosevelt, for example, is a man of exceptional energy.

C. The leader is not too far above the crowd. The effective leader of the masses cannot be too much above them. If he is, the crowd will not be able to understand him. President Wilson, although a man of genius, was never a popular leader. His vast education served to antagonize the relatively unschooled masses. Al Smith, on the other hand, attained at one time an enormous popularity by stressing the fact of his humble birth. Intellectual leadership has the same requirements as crowd leadership. Many great thinkers are not generally recognized as such, because even the scholars of their day are unable to appreciate the subtlety of their thinking.

D. The leader is aloof from the masses. Great military leaders, industrial executives, and statesmen are often lonesome. They dare not mingle too freely with the common herd lest familiarity breed contempt.

E. The leader is easily predictable. A leader who changes his attitudes abruptly is risking the loss of followers. People follow the leader because they think he will give them what they want. He has been chosen because of his past performance or on the basis of some platform of promises. If he changes his platform seriously, some re-alignment of loyalties must take place.

F. The leader knows human motives. A successful leader must know what people want in order to promise or give it to them.

G. The leader contrives to unify his followers. The clever leader welds all the drives of his followers into one coordinated pattern of action. Undoubtedly, the persecution of the Jews in Germany

was largely a device on the part of Hitler to build up a feeling of class consciousness among his followers, to make them feel superior and hence pleased with themselves. When leaders feel their hold slipping, they are prompted to stir up a war or other emergency, for in the community of action men forget their complaints and follow willingly.

H. The leader rewards and punishes wisely. The leader is clever at devising rewards and punishments which will motivate the followers. This is particularly important in the leadership of a small group or organization where the individual stands out as one to be reckoned with. In the case of leading large groups, this is not so important. The statistical consideration rules there. It is wise to lose one follower if thereby ten are gained. In a business organization one unloyal or discontented person, however, could impair the efficiency of the whole group.

The leader who has many high offices to fill or has vast sums of money at his disposal to be paid out as fees, commissions, wages or even as outright gifts to the faithful followers will most probably retain his leadership for some time. The punishment aspect is

FIGURE 72. *Leadership naturally falls into several categories, in not all of which will the leaders be calculating and opportunistic. A man generally held to be a notable example of simplicity and sincerity in high places is Secretary of State Hull.*



equally important, requiring even more skilful application. Too severe or unjust punishment might cause desertion. The problem is to punish for failure just as strongly as is possible without completely disrupting the followers.

*The emergence of the single leader.* After the leader has emerged, nothing succeeds like success. Once a particular individual is leading, he tends to gain more and more rapidly.

A. The leader salvages his opposition. In the final phase the clever leader is confronted with the need of salvaging his opposition. In general the leader who has conducted his campaign properly will be judged to be the best man by followers and rivals alike. Thus the newly elected leader is able to put the others to work as trusted assistants. This does not always happen, but it is one of the things a good leader strives for. If rivals cannot be salvaged, they must be transferred to unimportant posts.

B. The problem of maintaining prestige. The simplest way to maintain prestige is to use it. Parades under military escort, reviewing troops, inspecting battleships while the officers and men stand at stiff attention are devices used by the political leader to maintain his prestige. Hitler is a master in the art of maintaining prestige by showing his power. The more dramatically this is done the better. A vast crowd of thousands have been standing in the hot sun to hear their leader. He is already hours late, but nobody has left. Suddenly out of the sky a huge airplane swoops down, and Der Führer jumps out amid great applause. Expressions of approval from others who are approved by the crowd help. Newsreels and photographs of the leader shaking hands with eminent men all aid in maintaining the prestige so necessary to continued leadership. Brass buttons and fancy uniforms are helpful, too, in maintaining the prestige of the leader of the masses.

### *How to choose a leader in a democracy*

The democratic form of government is based on the practice of having the masses select from the several competing, prospective leaders one who is to be the spokesman for the crowd. Thus an important part of the duty of any citizen in a democracy such as ours is to learn to vote intelligently. Effective citizenship requires that we all study the performances and capacities of the various

candidates for office and put our support behind the one we think best. This is often hard to do, because the full facts are not available. In selecting a leader it is helpful to prepare a rating scale in which the names of the various candidates are placed at the heads of vertical columns. Then a number of considerations or values should be listed to the left of these columns, some being concerned with past performance, others with promises.

Next examine the platform and public utterances of the various candidates, asking yourself which candidate most agrees with your ideas of what is workable and desirable. After each point enter a check mark to show which candidate earns the highest rating. After this has been done, total up the check marks and fight for the man of your choice. If some new development takes place, enter the correction and total up the score again. By this method it is sometimes possible to cut under your prejudice or surface reaction. All too often we pick up stereotyped reactions and use them as guides to conduct without ever subjecting them to critical analysis.

## *Salesmanship*

**S**ALESMANSHIP is the art of selling anything at all, whether it be the selling of merchandise, services, or ideas. Thus a clergyman, a teacher, a social worker, and a public health physician are all salesmen. Salesmanship is one form of leadership.

### *Some simple rules of salesmanship*

Although no two persons are exactly alike, people have many traits in common. The following suggestions are given merely as ones which apply in a large number of cases. It is up to the individual to make the proper selection in a particular case.

*Having something worth while that people need.* The first rule applies to all situations. Have something of quality that people need and then devote yourself to making them feel this need and recognize the worth of your product.

*Knowing what you want.* Decide what it is you want. Then make every effort to get to your goal. If you want to "sell" the other person on a plan or product, you will be willing to lower your own prestige in order to attain that end. In a case of failure

to understand each other, you will openly take the blame by saying, "I didn't put that very clearly," or "what I meant to say was. . . ." If, on the other hand, your goal is to show the other person that you are brighter than he is, that you have traveled more, or that you know more interesting or important people, you will seize the opportunity to talk about yourself. In doing so, however, you will probably ruin your chances of selling him on anything.

*Creating a pleasant interest.* The first step should consist in getting the prospect interested in you. This first interest does not necessarily have to be related to your proposition, but it is well to have it not too remote. Most people are primarily interested in themselves and their own prestige in their social group. Subtle reference to the prospect's achievements and standing will frequently serve to gain his interest and liking. Compliments, when not too blatantly expressed, will serve to put him in an agreeable frame of mind and make him more receptive to what you have to sell. Mothers are frequently won by compliments to their children; old people are pleased to be called middle-aged; youths are pleased to be called mature; middle-aged people like to be thought of as youthful in spirit. Conservative people like to be called solid and substantial; radicals are flattered and pleased when they are called forward-looking.

Remember that avoiding a prejudice is just as important as touching upon an interest. Be certain of your ground before commenting on politics. Beware of telling funny stories which are injurious to the prestige of political, racial, or religious groups. It is wisest to let the prospect set the pace in the matter of stories.

*Being enthusiastic.* You should yourself be convinced of the value of what you are trying to sell. The expression of enthusiasm, if honest, will affect the other person favorably. The salesman of ready-to-wear suits should not have his clothing made by a tailor.

*Selecting your appeal to suit the prospect.* You have seen the importance of motivation in human behavior. Directing human behavior along a desired line consists in showing the person that a given line of action, whether it be buying something, supporting a movement, or voting for a candidate, will get the prospect something he wants. The appeal employed will depend upon how much



you know about the prospect. You should study the prospect in advance if possible. Know his likes, dislikes, amusements, and prejudices. If you are talking with a person known to be a "social climber," show the prospect that "the best people are doing it." If the prospect is thrifty, show him that the action will save him money, directly or indirectly. If the person is altruistic, show how his aid will render human service. If your prospect is a professional buyer, stress technical details and reasons why. In dealing with people face to face we are in a position to vary our attack when we see that it is not working. In the face-to-face relationship the speaker has the advantage of being able to study the listener's facial expression and bodily posture, to notice what he is doing with his hands, to observe the listener's line of regard, and to make a number of other observations as to how well his effort is succeeding. If individualized appeals are not possible, you must fall back upon the law of averages. To do so, however, is to pass up some of the advantages of the face-to-face appeal. The writer of advertising copy to be printed or broadcast by radio has to depend upon the law of averages. His attack is fixed. He cannot adjust it to a specific individual and hence must be content when it works with the largest number of persons.

*Letting the other person talk.* Learn to listen. Many a person has failed as a salesman simply because he or she felt called upon to do all the talking. The prospect should be encouraged to talk from the very outset, since in this way you can learn what his needs and problems are before offering a solution.

*Obtaining overt action.* Suppose that the object of your talk with some one is to obtain his support of some movement. Do not rest when the person has expressed his sympathy for the project. Make him do something about it. Perhaps the "something" will be a gift of cash, perhaps the signing of a petition, perhaps consenting to deliver a speech. At any rate, once the person's conviction has become a matter of public record, it is easier for him to carry on than to back out.

*Knowing when to "close."* Many a novice salesman has lost an order by talking too long. Often the listener is convinced and read to sign early in the interview, but the other talks so long that the first high interest gives way to boredom and finally develops

into outright irritation at being kept from his own duties. Knowing when to "close" is the most subtle of the salesman's repertoire of tricks.

The following indicators of the approach of the "critical moment" have been gathered from the pooled experience of salesmen, charity solicitors, and political campaigners. No one is infallible, but to depend upon any one of them is far better than to guess. (a) Does the prospect handle the articles being displayed? (b) Does he sit in an erect posture rather than slouch in his chair? (c) Does he ask questions? (d) Does he suggest possible uses of the article or possible advantages of the service? (e) Does he smile and act "friendly"? (f) Does he mention his disappointments with competing products or services? (g) Does he ask how much the article costs, "how can I help," "how much would you consider to be a fair contribution"? These are signs favorable to the close. They all indicate that the critical moment is at hand.

The indicators that the critical moment is not at hand—that it has passed or that it has not yet arrived are of course the reverse of those just pointed out. The prospect looks at his watch; sits slumped in his chair; refuses to handle the article or examine the statistical tables or graphs; asks no questions; frowns or looks bored; taps on the table with a pencil; looks out the window; asks questions obviously meant to "heckle" rather than to obtain information. To attempt to close when these signs are unfavorable will not only be unsuccessful but will make a subsequent call difficult. You must explain further or withdraw gracefully before the prospect rises and offers his hand with a formal, "Thank you very much, Mr. Blank, but I do not see my way clear to accepting your proposition."

*Knowing how to "close."* It is not enough to know when to close. Many a battle is lost in not knowing how to close. In general, the best technique seems to consist in minimizing the importance of the decision or in asking the final question in such a way as to assume the answer. An excellent closing line is: "If you will just sign here, Mr. Doe, for the sake of keeping our records straight." The addition of the word *just* seems to lessen the importance of the decision, seems to put it on the basis of the mere formality of record keeping, a request which in no way suggests

that Mr. Doe's word is not so good as his bond. This sentence also assumes that the decision is already made. Another technique is stating two alternatives both acceptable to the salesman and asking for the minor decision of choosing between them: "How would you want us to send out the pickles, by express or parcel-post?"

*Leaving the door open.* The good salesman does not wear out his welcome. Important decisions usually cannot be made on the spot. Associates must be consulted, figures studied, other salesmen interviewed. No decision is far better than a negative one. No decision leaves the matter open, while a negative answer closes it in a manner that makes it hard to re-open. The good salesman manages to get himself invited to come back and should keep an idea in reserve to serve as the basis of another meeting.

### *Sales resistance*

It is as important to buy well as to sell well. There is a psychology of *buymanship*. Here are some of its rules. Many of them are merely salesmanship in reverse.

*Controlling the interview.* When some one tries to sell you an idea or article, ask questions. How has it been tested? How do you know it is good? What is in it? Insist that your question be answered in full at the time. A perennial device of the "high-pressure" salesman in handling embarrassing questions is the old "*I'll come to that*" dodge.

Don't say "yes"; say "maybe." A favorite trick among salesmen is to keep the prospect saying "yes" until his yes becomes automatic and almost unconscious, at which point the high-pressure man springs to the "close."

*Taking time to think it over.* There are very few occasions when a real bargain is lost by being deliberate. A really good proposition will stand up after a night's sleep. The salesman of worth-while things prefers that you take your time. He knows his stuff is good and why, and wants you to be equally sure.

*Being on the alert for all salesmanship devices.* Be on the alert for all the devices of the snake-oil peddler. A salesman of a good product or idea does not need to rely exclusively on tricks. If he uses them too freely, look for a defect in his proposition or product.

## *Competition vs. Coöperation*

IN THE LONG history of people's trying to get along with each other, two theories have been evolved. One holds that individuals in a group will naturally compete and should be encouraged to do so—that, spurred on by competition, children will learn more, business will thrive, and nations will become great. The other theory holds that competition is too often destructive, that only as we coöperate can we build permanently. Clearly two problems are involved here—inevitability and desirability. In other words, we must investigate two questions: (1) Is there an instinct of competition, and (2) What are the effects of competition and coöperation? Only as we answer these questions can we help settle the controversy and advise how best to plan conditions so that the most and best work will be done with the best results to the character and personality of the individuals involved.

### *Is there an instinct of competition?*

The question as to whether there is an instinct for competition has a profound social significance because it has a direct bearing on our tradition of individualism. People who have been conditioned in an essentially competitive society such as ours in the United States and for that matter in most of the world today do respond to the challenge of beating the other fellow. Is this a necessary characteristic of human nature? Must we stand with one foot on the neck of the vanquished in order to be happy? There are human societies, that of the Samoan Islands, for example, where life is largely uncompetitive. People work and store the products of their labor in a common warehouse from which all can draw according to their needs. Anthropologists report that such people are fully as happy as their more individualistic fellow men in other parts of the world. Whether or not such simple community life would work in a more complex society is a question which has not yet been put to a conclusive test and remains, therefore, unanswerable for the present.

Psychologists today feel that competitiveness is not an inborn psychological trait. We can teach children to compete or to coöperate or to achieve a balance between the two.<sup>15</sup>

*What are the effects of competition and coöperation?*

In studying the effects of competition and coöperation there are three aspects of the problem to be considered. How do competition and coöperation function as motivating forces? The best indication would be the amount of work done. How about the quality of work done under the two conditions, and does better quality result from the same conditions inducing greater quantity? And finally, what is the effect on the character and personality of the individuals involved?

Sims performed two experiments to compare competing as an individual with competing as a member of a group as conditions motivating learning.<sup>16</sup> The first experiment studied the effects of the two types of competition on learning to use a code.

Three sections of college students of equal initial ability practiced the assigned task three times per week until twelve practice periods had been completed. The motivating conditions under which the three groups worked were as follows:

(1) Control group. The subjects of this group were instructed as to what they were to do but were not told how good or bad their performances were.

(2) Team competition. Two equal groups competed with each other with knowledge of the scores of both groups as a whole but without being told their individual scores.

(3) Individual competition. Each individual was told his scores and the scores made by his rival.

The results show clearly that in our present social pattern individual competition is superior to group competition as a condition motivating learning. All groups were equal in performance at the beginning, but after practicing under the different conditions of motivation they showed considerable differences in final ability. When gains were expressed as the difference between the final performance and the initial, it was seen that the control group showed an improvement of 36.8 points; the team-competition section, an improvement of 39.7; the individual-competition group, 57.1.

Sims's second experiment used speed of reading measured by standardized tests as the task. Results similar to those of the first experiment were obtained, as shown in Table 52.

TABLE 52: *Relative Efficiency of Team- and Individual-Competition in Increasing Reading Speed*

GROUP	INITIAL ABILITY	FINAL ABILITY	PER CENT GAIN
Control	167.3	181.9	8.7
Team-competition	167.5	191.9	14.5
Individual-competition	167.7	226.0	34.7

Maller has studied coöperation and competition as factors motivating school work.<sup>17</sup> Using simple addition as the task, Maller found that personal motivation (working for oneself) and group motivation (working for the group) are both more effective than work which is not so specifically motivated. Boys persisted longer than girls in working for the group, but girls persisted longer than boys in working for self. Curiously enough, however, girls more frequently than boys chose to work for the group when free to accept either condition. To what extent these differences represent the effects of culture and to what extent, if any, they are dependent upon inherited differences between the two sexes cannot be inferred from the data. The best guess is that cultural factors are more important than biological ones.

From the experiments just described and from others, Maller worked out the following hierarchy of motivating conditions among school children:

- (1) Boys working against girls as individuals.
- (2) Working for self.
- (3) Working for the team.
- (4) Working in partnership.
- (5) Working for classroom as a whole.
- (6) Working for a group picked arbitrarily by an outsider.

You must bear in mind that these are average results. There are great individual differences among children in the nature of the motivation which is most effective. As with older people, some thrive in a highly competitive atmosphere; others are motivated more by the ideals of service.

School-teachers make particular use of individual competition in stimulating their pupils to greater effort. Possibly most widespread in this country is the practice of preparing a "Roll of

Honor" containing the names of the members of the class who have never been absent or tardy or who stand at the head of the class in their studies. Children take such honors very seriously and strive hard to be included in the select list.

The practice of grading according to the normal probability curve is essentially a competitive method of grading. In this method the grade earned by a particular student depends upon his rank in the class as based on his performance in examinations and other ways of rating his ability. There is room at the top for only a certain percentage of the class; another percentage is certain to fail. This method of marking emphasizes competition with the other fellow and has its advantages and disadvantages.

Alert sales managers take advantage of the fact, thus so clearly demonstrated in the psychological laboratory, that competition between individuals is more effective than competition between teams. In the office of a sales manager one will sometimes see a big blackboard on which the names of the salesmen in the different territories are listed in a vertical column. To the right of this list of names there will be a series of vertical columns each headed by a date. In these spaces will be the rank of each man on the basis of the amount of his sales. An even more effective manner of emphasizing the individual nature of competition in sales work employs a graphic chart in which each man is represented by a push-pin with a certain colored head. At critical dates agreed upon and announced in advance the work of each man is totaled up and his position shown on the huge graph by means of the proper push-pin. Thus it is possible to see at a glance what each man did in each period, which man is making the most gains or losses as compared with his fellows, and what the group as a whole is doing. This procedure is psychologically sound and to be recommended to any sales manager in charge of a group of men working under constant conditions. Of course some territories are better than others, i.e., they have a higher "sales potential." To eliminate unfairness in competition, which would greatly undermine the value of the graphic device, it is necessary to make fair and previously announced corrections for difference in the "toughness" of the territories of the various competing salesmen.

This method can be effectively combined with the bonus plan.



Its effectiveness lies in the fact that individual competition is emphasized through continued publication of each man's relative standing. Bonus plans work well with salesmen, because they tend to be more competitive than persons in most occupations.

*Quantity vs. quality.* Recently Whittemore performed an experiment to test the effect of competition as compared with non-competitive work on the speed and quality of output.<sup>18</sup> The subjects in this experiment worked in groups of four at copying newspaper stories with a set of rubber type. Two types of instruction were used alternately: (1) "Try to get as much work done as you can, remembering that both the quality and the quantity of the work you do will count in your final score. Don't attempt to beat your fellow workers"; and (2) "Try to beat your fellow workers, remembering that both the quality and the quantity count in your final score. You may use any method you see fit to employ in keeping track of the progress of your competitors. Compete!" The results indicated clearly that the subjects produced more work under conditions of competition but that it was of poorer quality. The number of mistakes was increased by competition. Evidently competition produces a win-at-any-cost attitude which is frequently not conducive to the best quality of work.

Watson has given us an experiment which illustrates beautifully an advantage of the coöperative situation over the competitive effort.<sup>19</sup> The subjects were graduate students in education. During the first phase of the experiment they worked as individuals assigned to the set task of making as many words as possible from a given set of nine letters. The poorest individual, working by himself, constructed 18 words in ten minutes, the average individual 32, and the best 49 words. Later the subjects met and worked in groups. The results of working under this type of coöperative condition were much better. The average score of the group under coöperation was 75 words, which was better than the score of the best individual working alone. It is in situations of this sort that the value of coöperation over competition is most evident.

*Social facilitation without direct competition.* The presence of the group exerts an influence on the performance of its members even though the situation is not essentially one calling for com-

petitive effort. Allport conducted an experiment in which subjects were told that their work was not competitive. They were not even permitted to compare their results.<sup>20</sup> In one phase of the experiment fifteen subjects took a free-association test of the sort that you have already studied. They were asked to write their associations (the first word thought of after reading the stimulus word) on specially prepared blanks. The same subjects worked alternately alone and in groups of five. The number of associations written in three minutes was taken as the measure of work. Fourteen of the fifteen subjects in this experiment showed facilitation when working in a group even though they had not been directed to compete. Other experiments showed this effect to be due not entirely to faster writing under conditions of social facilitation but also to faster thinking when in the group as compared with being alone. The individual appears to compete with the group consciously or unconsciously even in the absence of directions to do so.

Elkine conducted an experiment to reveal the effect of the presence of others on the retention of memorized materials.<sup>21</sup> It was found that lists both of words and of numbers learned by subjects in groups were remembered better than those learned alone.

*Specific effects on the individuals involved.* Is it good for people to compete? What does competition do to them? Is there such a thing as too much competitiveness? These are questions which deserve a careful answer.

A. Effects on morals. There is danger that too much emphasis on competition will make children or adults want to win at any price. They will win even if they have to cheat. There is an even greater danger that preoccupation with the competitive aspects of the school situation will blind the student to the more remote but more fundamental aims of education. He should learn because learning makes him a better member of society or because he wants to know and not simply because high grades will win a prize or honor of some sort. The student who is too much concerned with beating the other fellow may cease to be concerned with earning the respect of that fellow in other ways.

B. Effects of discouragement on the loser. We must not lose

sight of the fact that there must be a loser if there is to be a winner. What happens to the fellow who never wins? Does he continue to work hard even though he knows that somebody else will get the prize? Experimental results show that the discouragement of failure greatly reduces the person's efforts the next time. "You can't win; so what's the use of trying?" says such a student as he turns his attention to something of more interest to him. Gates and Rissland studied the effect of knowledge of success on test scores.<sup>22</sup> These subjects were placed in three groups of equal ability. Each person was then given a second test. The subjects in one group were encouraged just before their second test by the experimenter's saying to them: "That is really splendid! Do you always make such good scores? . . . Your score is so good that I wonder if you would mind repeating the test." The second group was discouraged by the experimenter's saying to them: "Oh, dear, that is really a very poor score," etc. The third group was neither encouraged nor discouraged. As is seen in Table 53, encouragement is superior to discouragement in getting people to excel a previous performance. Those subjects who were poorest in the first trial were most sensitive to discouragement.

Sears conducted an experiment the results of which strongly support the conclusions derived from the Gates and Rissland study.<sup>23</sup> In the Sears experiment twenty college students were divided into two equal groups on the basis of their demonstrated ability to sort playing cards and to learn to repeat short lists of

TABLE 53: *Showing the Effects of Encouragement and Discouragement on Subsequent Performance of Two Different Tasks*

	% * IMPROVING	% FALLING OFF	% REMAINING THE SAME
COORDINATION GROUP			
Encouraged	89	11	.0
Discouraged	70	26	.04
Neither	64	28	.08
COLOR-NAMING GROUP			
Encouraged	58	38	.04
Discouraged	51	40	.09
Neither	44	48	.08

meaningless words. Each subject was paired with another one of exactly equal ability as shown by the pre-tests. Each subject was then given 15 trials at card sorting on each of three days. The card sorting on each day was preceded and followed by the learning of a list of 10 nonsense syllables. The subjects of one of the two groups were discouraged by false statements to the effect that their *card sorting* was decidedly below par; the other group were encouraged by similarly false statements to the effect that their sorting was of superb quality. Nothing was said about the quality of their learning on the word lists. Did the praised and encouraged students, content to rest upon their records in the first test, let down in the second? Did the discouraged students "buck up" in fine American fashion to show that they could make good despite a bad start?

Neither of these reactions occurred. The card sorting of the discouraged students became progressively worse throughout the course of the experiment, which covered a period of three days. The praised ones worked harder and continued to improve.

You have noticed that the experimenter said nothing to his subjects about their performance in learning nonsense syllables. They were neither encouraged nor discouraged, falsely or honestly. It is thus the more striking that, where the subjects were discouraged, their ability to learn nonsense syllables showed the same falling off that was found in the card sorting. Likewise, praising the subjects' performance in one task caused them to do better than the discouraged group in the other tasks, too.

Thus in our final appraisal of the effects of person-against-person competition we must not lose sight of the effects of failure on those who fail. Failure is not the stimulant that many people believe it to be. Success is more effective in producing greater accomplishment.

*Avoiding the evils of excessive-competition.* There are several ways in which the efficacy of competition can be retained without placing undue emphasis on the socially destructive desire to beat the other fellow by hook or crook and in which discouragement arising from failure can be largely averted.

One plan for awarding prizes takes advantage of the competitive drives of people but also permits the poorer subjects to

enjoy the thrill of winning. At the end of the first contest the members of the group are ranked from best to poorest. The announcement is made that in the second contest the prizes will go to the persons who most improve their ranking, i.e., who pass the largest number of individuals in performance. This is sheer and undisguised person-against-person competition, but it is better than the traditional setup in that it affords ample opportunity for the poorer performers to enjoy the pleasure and benefits of success.

Another way is to reward the person who improves his ranking by the largest number of points. Under these conditions the members of the group are competing against their own records as much as they are competing against each other. This plan, too, retains much of the effectiveness of the competitive situation in which there can be but one winner but gives an opportunity also for the poorer individuals to win—something which they badly need and seldom get.

A third plan for conducting classroom contests avoids the evils of excessive competition and is strongly recommended for use with groups that are becoming too much imbued with the philosophy of the superman. At the end of a pre-test, the members of the group are instructed to compete against their own scores without regard to the performances of others. The prize or the honors go to the person who improves his previous record by a set number of points. The teacher or director of the contest must be careful to set the standards in such a way that success is fairly easy.

Individuals tend to protect themselves from the bad effects of repeated failure in competitive situations by lowering their "level of aspiration" to some point within reach. The average person hitches his wagon not to the stars but to a horse.

Pennington had each member of a large class of students state the grade they expected to receive on an important test to be held the next day.<sup>24</sup> Exactly half of the students reached or surpassed their level of aspiration. When the second important test came along, the students were again asked to state their aspiration (grade they expected to receive). Of those who failed to reach their expected grade on the first test, 34 per cent lowered their second aspiration to the grade actually received the first time; 66 per cent restated their original aspiration. Of those who had

succeeded in reaching the expected grade in the first test 62 per cent restated their levels of aspiration for the second test; 36 per cent raised them; and 2 per cent lowered them. We change our goals to make them square with our abilities. The good teacher arranges his assignments so that success occurs more often than failure.

*Conclusions from experiments on competition and coöperation.* The experiments which we have been considering are typical of many which have been conducted in this field. Their results, taken as a whole, show clearly that human beings work harder when in groups than when alone; when competing as individuals rather than as teams. This fact can be taken advantage of in business, in the classroom, on the playground, or in any situation where we wish people to exert a greater effort. But in our efforts to control behavior we must be careful not to overdo the business of competition. Competitive situations which consistently deny certain members of the group the possibility of success experiences should be avoided. Moreover, competitive situations frequently encourage emphasis on quantity rather than quality and thus in the long run make for decreased rather than increased efficiency. Then, too, we must remember that the cultural pattern is slowly changing from emphasis on competition to emphasis on coöperation. In time this will change the direction of the results obtained in experiments such as those presented above.

### *Judging Human Nature in Everyday Contacts*

THE JUDGING of personality is part of the business of living in groups. We are continually being confronted by the necessity of forming some estimate or opinion of the people whom we meet. Is that fellow honest? Is she the kind of person I would like? Is this gentleman of the confident manner bluffing, or is he really the expert he claims to be? Is that timid person the great General Blank whose name we have been reading in the papers? The reading of human character from manners and appearance has always been a fascinating activity. Extravagant claims for certain methods of judging personality have been made by many unscrupulous persons. We have seen in earlier chapters that judg-

ments based on appearance and facial expression, especially in photographs, are often inaccurate and usually influenced by stereotypes, halo-effects, and knowledge of the situation. This section will attempt to answer certain other questions concerning fact and fable in everyday judging of personality.

*What does the speaking voice reveal?*

Popular belief has it that the voice reflects the personality of the speaker. One commentator shows extravagant confidence in the power of the human voice to express personality. "The human voice, when the man is not making conscious use of it by way of impersonation, does, in spite of himself, reflect his mood, temper and personality. It expresses the character of the man. President Roosevelt's voice reveals sincerity, good-will and kindness, determination, conviction, strength, courage, and abounding happiness."<sup>25</sup>

The psychologist in reading this would want to know how much the commentator had been influenced by what he had read of Roosevelt in the papers. Specifically, the psychologist would like to know whether the author of the quotation is a Democrat or a Republican. The only fair test of the power of voice to reveal personality would be one in which the voice rated is that of an unknown person not present to the eye. Under those controlled circumstances alone could the degree to which traits of character and personality are revealed by the voice be accurately measured. Several experiments of this sort have been conducted recently.

A Viennese psychologist, Herzog, studied the judgments of some 2700 radio listeners of the voices of a number of radio speakers.<sup>26</sup> The listeners attempted to rate the following on the basis of voice: sex, age, vocation, height, weight, habituation to dominating other people, agreeableness of the voice. All of these characteristics were judged more accurately than would be expected by chance.

Allport and Cantril also report a series of well-controlled experiments in which the ability of listeners to judge personality traits of untrained speakers was investigated.<sup>27</sup> It was discovered that numerous traits, such as dominance, introversion, sex, age, height, and even political preferences, could be judged with better than



chance accuracy through listening to either the normal voice or that transmitted by radio. The judgments based on the normal voice were only slightly superior to those based on the radio-transmitted voice.

The implications of these results are clear. Voice is an important factor in good personality. The one who wishes to increase his social effectiveness should eliminate as many faults as possible and should, preferably through the aid of a good teacher, strive to develop desirable voice qualities.

Fay and Middleton investigated by experimental methods the extent to which speakers over a public address system can be classified into the Kretschmerian types, pyknic (fat), leptosomatic (slender) and athletic (ideal type of masculine development).<sup>28</sup> (See p. 467.) Nine college men, three for each of the three body types, were used as speakers. Each speaker read over a public-address system, in which high fidelity of voice transmission was carefully controlled, a paragraph which took approximately 45 seconds. The readers had practiced reading into the microphone but were not permitted to practice reading the experimental materials. They were not told the purpose of the experiment. The listeners were 30 students in a psychology class seated in a favorably located audition room. Brief descriptions of the three body types had been given the listeners just before the experiment. The announcer introduced each speaker by number, from 1 to 9, and at the end of each selection the listeners labeled the voice as one of the three types. Precautions were taken to insure that the speakers were unknown to the listeners.

The results indicate that certain voices seem to portray a particular body type. The percentages of the listeners' ratings for three representatives of the three constitutional types was superior to chance. The average order of accuracy of judgment was: pyknic, 22 per cent; leptosomatic, 20 per cent; athletic, 1 per cent. Chance would account for an average accuracy of only 11 per cent approximately. It will be noted that the two extreme body types were judged more accurately than the middle (athletic) type. Thus the judges' stereotypes would seem least likely to correspond to the facts in the case of individuals of the athletic body-build. Female listeners were slightly superior to male listeners, although

the sex differences were almost negligible and probably not reliable. This experiment suggests a practical use to be made of stereotyped voices in the broadcasting of dramatic materials over the radio. The casting of characters could be greatly improved by selecting voices that "go with" the body-build of the character.

*What does handwriting tell us?*

In the gay 90's people were judged by their handwriting. It was felt that good writing indicated good personality. Since that time many commercialized schemes of analyzing handwriting have sprung up. The work of graphologists, so called, should not be confused with that of the scientifically trained handwriting experts who study examples of handwriting to detect forgeries.

One typical experiment by Powers will serve to give an impression of the limitations of graphology.<sup>29</sup> Character sketches of ten adult males in varied walks of life were prepared by a committee of three psychologists. These descriptions and samples of the handwriting of the ten men were given to 17 professional graphologists, 143 college students, and 25 faculty members, with instructions to study the handwriting samples and match them with the sketches. A sample of handwriting used in this experiment and a character sketch of its author are given below.

*'I am sorry,' he said. 'but that is the truth!'*

*He went back into the house. These were the last words I ever heard him speak.*

*I wonder, however, that I had the strength to get up and go away.*

A\_\_\_\_\_, though only 31 years old, is already one of the leading authorities in the world on certain aspects of early theological doctrine. He is an expert on manuscripts in several languages. He holds advanced degrees from Harvard and Oxford. His mother comes of an old family, and his home is filled with early American antiques and family memories. In such an environment he grew up, gradually increasing in contempt for

his fellows who continually made life miserable for him at school and in the streets. He is timid physically. He cannot drive a horse or an automobile very well, chiefly because he is afraid of getting into difficult situations or getting lost. He exaggerates slight illnesses and consumes much medicine. When he finished theological training, he repudiated ordination, and put his knowledge to use by writing on the disputes of the ancient Church Fathers. He went to England, immediately fell in love with English ways, and never in England has he been taken for an American. He is thoroughly English in manner and prefers to live there. He works speedily and effectively, but is restless. He is totally incompetent along mechanical lines, and his one accomplishment in sport is his brilliant game of chess. He ill conceals his boredom at others' comparative slowness, unless he puts himself out to be charming, when he succeeds very well. He has quick appraisal of objects of beauty, the worth of ideas, and the nature of people. He discloses a buried sensitiveness when he talks about himself, which is seldom. Before a friend can speak words of sympathy and understanding, he has set his problems aside with a witty remark. His intellect, which is sharp and satirical, prevents the needs of his nature gaining too strong a hold over him. When asked to give a sample of his handwriting for the experiment, he wrote: "I enclose a specimen of my handwriting and hope devoutly that you will be wholly unable to deduce anything about my character from it. If I expose the horrid truth every time I take my pen in hand, I must resort to a Remington even for signing checks."

The results with the three groups of judges are reproduced in Table 54.

The average numbers of correct matchings for the three groups

TABLE 54: *Numbers and Percentages of Correct Matchings (by Three Groups of Judges) of Ten Character Sketches and Handwritings*

CORRECT MATCHINGS	UNDER-		PROFESSORS		GRAPHOL-		COMBINED		CHANCE	
	No.	%	No.	%	No.	%	No.	%	No.	%
0	24	16.8	4	16	1	5.9	29	15.7	68	36.8
1	44	30.8	7	28	2	11.8	53	28.6	68	36.8
2	34	23.8	7	28	7	41.1	48	26.0	34	18.4
3	28	19.6	5	20	4	23.5	37	20.0	11	6.1
4	10	7.0	1	4	2	11.8	13	7.0	3	1.5
5	1	0.7	1	4	1	5.9	3	1.6	0	0.3
6	2	1.4	0	0	0	0	2	1.1	0	0.1
7-10	0	0	0	0	0	0	0	0	0	0.0
MEDIAN OF CORRECT MATCHINGS										
	2.1		2.2		2.8		2.1		1.4	

show that the professional graphologists are only slightly better than the faculty men, who in turn are only slightly superior to the undergraduates. These differences are in the direction we would expect if there is any validity in graphology. Of the entire 1850 attempted matchings, 339, or 18.3 per cent, were correct. The chance expectancy as calculated on the law of probability is 10 per cent. The difference between 10 per cent and 18 per cent shows the degree of reliability of graphology. Perfect accuracy would of course be indicated by a score of 100 per cent. We conclude then from this experiment that there is some truth in graphology but that it is not a dependable method of hiring people or of deciding upon the guilt of a criminal in the absence of other evidence.



The normal human being wishes to make friends and to get along smoothly with casual acquaintances and associates. Although the habits of a lifetime are not easily changed, there are many mannerisms which we can change if we know that they are annoying to people.

Marriage means far more than socially approved sexual expression. It is a career for which people should prepare. Those who marry in haste without taking time to analyze their fitness for the responsibilities of marriage are likely to divorce later on. There are many factors making for success or failure in marriage. Most important for success is a fundamentally coöperative attitude. Studies show that for happiness in marriage the two individuals should be alike in some traits, different in others.

In any group leaders will arise. The techniques for effective leadership require a broad understanding of human motivation. Where we choose our own leaders our responsibility for keeping well informed is correspondingly great.

Effective business methods frequently involve appealing to people's motives. People respond to appeals to their feelings of personal worth; praise is better than blame in getting people to work harder; success is the great impetus to further success.

The judging of personality is part of the business of living in groups. It is well to know whether our estimates are founded on fact or fable.

### *Recommended Readings*

ALLEN, E., DANFORTH, C. H., and DOISY, E. A. (Editors). *Sex and Internal Secretions*. Wood, 1939.

Twenty-five authors present new experimental evidence concerning the endocrinology of sex function, chiefly from the medical viewpoint.

BURGESS, E. W., and COTTRELL, L. S. *Predicting Success or Failure in Marriage*. Prentice-Hall, 1939.

Study of married couples to find out why most of them were happy and what made the others unhappy.

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*"Man perfected by society is the best of all animals."* ARISTOTLE

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## CHAPTER 16

# PSYCHOLOGY AND SOCIAL PROBLEMS

*Our social ills and some things we can do about them. Delinquency, crime, war—these are the diseases. Education, sterilization, better housing are among the suggested cures. Here you will find more diagnosis than therapy.*

MAN IS A PRODUCT of heredity and environment. His environment is more than a world of physical objects. The institutions and the culture of the society in which he lives determine the direction of his development quite as much as do the physical objects in it. If society is to direct its present and plan for its future, its leaders must understand the important rôle both heredity and environment play in determining the direction in which one's inherited abilities will be expressed. It is not sufficient, for example, that a society build a rich culture or a large store of social wealth unless these are fairly distributed among the members of that society on the basis of each individual member's needs and abilities.

In this chapter you will learn what the psychologists have to say concerning some of the more pressing social problems. You will learn also that in many instances the problems themselves are more apparent than the solution. Psychologists and other social scientists simply do not know enough about certain social problems to present a hundred-per-cent effective program for their solution. In this instance, however, a little knowledge need not be a dangerous thing if the smallness of that store of knowledge is recognized.

How to make the human race better, brighter, and happier through education and the democratic way of life, how to reduce crime by employing a greater understanding of the nature of the criminal, and how to avoid war or at least to reduce its greatest evils are some of the pressing social problems concerning which the psychologist has something worth while to say.

### *Toward a Better Nation*

**I**N RECENT YEARS people have become more and more socially conscious—more and more disturbed by certain social injustices and by the many indications of forces at work which are not contributing to the general welfare. Reforms of all kinds have been suggested and championed. In some countries whole governments and social systems have been changed in an effort to right social wrongs.

#### *Eugenics vs. euthenics*

Experts in the social sciences have proposed two broad programs for the betterment of the human race. One program operates through the control of human heredity. The other relies upon the improvement of the social and physical surroundings in which people grow up.

*Eugenics.* Eugenics would improve the race through control of heredity. According to a eugenic program of race betterment, the individuals of inferior heredity would be denied the right to bear children to perpetuate their taint.

Advocates of eugenic programs point to the influences which



are at the present time operating to lower the quality of the human stock of the Western World in particular. Foremost among these factors is warfare. Our modern practice of warfare eliminates from the stream of heredity the best men, physically and mentally. The physical weakling, the feeble-minded, and the unstable personality either fail to reach the front and are never exposed to the risk of mutilation or death which falls to the lot of the physically and mentally able or, if they are put in the trenches, have a breakdown at the first sight of battle (shell-shock).

Another factor having a similar effect is the fostering of the weak and defective through various forms of charity. Recent sociological surveys have shown quite consistently that the birth-rate in families dependent on charity is much greater than in those which are self-supporting. Although there are many exceptions which must not be overlooked in this connection, in general the families which have had to accept relief for a period of several years are inferior in ability to those which have been able to take care of themselves all or most of the time.<sup>1</sup>

War, charity, and care of the defective do not exist in primitive society in the way we have them. When life was primitive, the physically strongest and the most cunning survived in the struggle for existence and, as a rule, left a longer string of progeny than the weak, who perhaps were eliminated even before they reached sexual maturity. Even in the early warfare of man, made up as it was of hand-to-hand fighting, the strongest and the quickest and the most cunning survived.

Believers in eugenics have been so impressed by what seems to them an ascendancy of inferior groups that they have suggested many methods for restoring the balance to "the positive side." Three of these methods are briefly discussed below.

A. Sterilization of the unfit. In 1939 there were twenty-nine states in the union having laws providing for the sterilization of the biologically unfit.<sup>2</sup> Table 55 shows what use each of these states has made of its sterilization law. The effects, limitations, and abuses of this method of social control remain to be seen.

B. Bonuses for the superior. The practice of giving cash bonuses for each child born to biologically superior parents has not as yet attained any great momentum. An illustration of this program,

however, is the practice of the National Research Council of allowing \$200 for each child born during the father's tenure as Fellow. This practice if extended, argue the advocates of eugenic

TABLE 55: *Number of Eugenic Sterilizations Performed in State Institutions under State Laws up to January 1, 1940\**

STATE	DATE LAW PASSED	MALES	FEMALES	TOTAL
Alabama	1919	129	95	224
Arizona	1929	10	10	20
California	1909	7,058	6,668	13,726†
Connecticut	1909	23	386	409
Delaware	1923	308	275	583
Georgia	1937	25	33	58
Idaho	1925	4	10	14
Indiana	1907	490	413	903
Iowa	1911	85	132	217
Kansas	1913	1,294	886	2,180
Maine	1925	14	153	167
Michigan	1913	485	1,550	2,035
Minnesota	1925	350	1,409	1,759
Mississippi	1928	146	360	506
Montana	1923	55	127	182
Nebraska	1915	146	226	372
New Hampshire	1917	65	330	395
New York§	1912	1	41	42
North Carolina	1919	178	680	858
North Dakota	1913	156	322	478
Oklahoma	1931	85	348	433
Oregon	1917	527	863	1,390
South Carolina	1935	1	23	24
South Dakota	1917	185	339	524
Utah	1925	120	101	221
Vermont	1931	53	140	193
Virginia	1924	1,442	2,011	3,453
Washington	1909	145	417	562
West Virginia	1929	1	42	43
Wisconsin	1913	151	916	1,067
TOTAL		13,732	19,306	33,038

\*In many states lacking sterilization laws, the state institutions sterilize patients with consent. No account is here taken of such operations, or of those that are primarily therapeutic, rather than eugenic, in purpose.

†536 voluntary sterilizations in state penitentiaries are not included.

§The New York law was declared unconstitutional in 1918.

programs, could easily become of great importance in building a better race of men.

c. Birth control. Birth control includes any method of voluntary regulation of the size of families through the prevention of conception. Attempts at eugenics through this method are still closely restricted by law in many states.

We have seen in preceding chapters that some traits are primarily determined by hereditary factors, certain other ones mainly by environmental factors. Eugenics, or control of heredity, then, would be effective in bettering the race only to the extent that the traits deemed undesirable are determined by heredity.

Euthenics. Euthenics includes any attempt to improve the quality of the human race through manipulation of the environment. Efforts to reduce the differences in purchasing power between the richest and the poorest people among us are essentially euthenic programs. Such efforts are now being made through increase in the wages of the worker and reduction of the profits of the employer.

Many people feel that the defects of the human race can be cured through betterment of such environmental influences as housing, food, clothing, recreation, moral training, and education. Although such measures could not be expected to influence traits primarily determined by heredity, we know from preceding chapters that many traits are not so determined. Many character and personality traits vary widely from one country to another, leading us to believe that wise control of environmental conditions might bring about desired changes in personality traits.

### *The trend of intelligence in the nation*

The question of whether the intelligence level of our country is changing in either direction is one which has many implications for present-day life and for the life of the future in the United States. Are the voters of the United States and of the world in general becoming more intelligent or less so? There are many factors influencing the average intelligence level of this country. The two most important of these are differential immigration and differential birth-rate. Differential immigration means a preponderance of people coming in from other countries who



FIGURE 73. *To some extent these children will be alike or different because they were born that way; to a large extent, probably, they will be strikingly different because of the contrast between a sidewalk and a preschool.*



are either above or below the average of the country they are entering. A differential birth-rate occurs when parents at one end of the scale have more children than those at the other. The evidence is that both factors are operating or have been operating in the direction of lowering the intellectual level of the population of the United States.

*What is the average level of intelligence at present?* The statement, familiar to all, that the average man has the mind of a thirteen-year-old, proceeding from an analysis of the numerous test results gathered on the army-drafted men during the World War, has occasioned a great deal of comment, skepticism, and pessimism. Much of this talk has been idle, prompted by insufficient knowledge and understanding of the results.

The 1917 draft law provided that men should be drawn by lot for army service from the list of registered men. But drawing was not wholly by lot, since many men of superior ability were needed for necessary civilian activities. On the other hand, the downright feeble-minded men were in institutions and not subject to the draft. Others who were obviously of inadequate mentality were rejected by local draft boards and never reached the camps to be tested. It is difficult to say just how much these factors balance out, but there is reason to believe that the men who were tested at the various army camps represented a pretty fair sampling of all men in the United States. Table 56 shows the average scores of the drafted men and of the officers stated in terms of Stanford-Binet mental-age equivalents.

TABLE 56: *Average M.A.'s of Draft and Officers As Derived from Army Alpha Scores*

SUBJECTS	MEAN M.A.	NUMBER OF CASES
Draft	13.1	93,965
Officers	17.3	15,544

This surprising and uncomfortable indication that the average white adult in the United States is equal to a thirteen-year-old child should be taken for what it is worth, for no more or for no less. It simply means that the average drafted man does as well *on the particular tests in the Army Alpha* as does the average child of thirteen. Evidently the type of material represented in the

Army Alpha is a kind for which the ability of the average person grows but little beyond the age of thirteen.

*Did America get the dregs of Europe?* The population of the United States has been greatly augmented in the last sixty years by enormous influxes of immigrants from Continental Europe. Since the Great Depression the number of those coming in has declined, for the restrictions on immigration have been tightened. It is of significance for social planning to see just what was happening to the intelligence level of the United States during the period of almost unrestricted immigration from Europe prior to the World War.

Brigham analyzed the intelligence-test scores of 81,000 native-born Americans, 12,000 foreign-born men, and 23,000 Negroes.<sup>3</sup> His essential data were taken from the report on the psychological testing in the United States Army and show very definitely certain fundamental trends in recent European immigration. It was found that those persons who came to the United States twenty or more years prior to the World War came from northern Europe and were just as good in intelligence as the native-born white Americans. The individuals who came to the United States just prior to the war came from southern Europe and were definitely inferior in intelligence as shown by the tests. It has been suggested that this result was not due to a progressive lowering of the quality of immigrants but represented rather a defect in the test, in that language is such an important factor that those persons who have been here only a few years were penalized. Although this argument has some validity, it should not be overworked. Immigrants who did not know English were tested on the non-verbal *Army Beta*, and hence the results were not subject to a language factor. Moreover, the immigrant usually learns English within the first three or four years as well as he will ever learn it. Leaving aside the question of language facility, we still have the possibility that contact with the superior economic advantages of the United States over those of southern Europe would bring some increase in tested intelligence, giving an advantage to the immigrants who had been here longest. The same question arises in the case of Negroes coming to New York from the South. Klineberg found that at first their intelligence-test scores tended to rise.<sup>4</sup>

After the third year of residence, however, no further increases in measured intelligence were observed. The facts given above seem to indicate that Europe donated some of her least desirable people to the United States with increasing liberality between the years 1900 and 1917. We cannot, of course, conclude from these results that the average intelligence of the southern Europeans who *stayed in Europe* is inferior to that of the northern Europeans in Europe.

This fact is significant in laying a basis for the prediction of the future intellectual level in the United States. It so happens that the very nationality groups which have represented the lowest intellectual ability among our immigrants are the ones in which the birth-rate is the highest. We will have more to say about the direction and possible effects of this differential birth-rate.

Now, when immigration to the United States is at a low ebb, is just the time for a reformulation of our immigration policy. The expense of administering a standardized intelligence test to all applicants for admission to this country would not be prohibitive in cost and could bring untold benefits.

*Are the bright people holding their own?* It has been demonstrated again and again that the brighter people marry later and have fewer children than the duller ones. Let us examine some of the evidence.

Using data assembled for 4330 children ranging in age from six to twenty years, Lentz compared the I.Q. as obtained with a standardized intelligence test with the number of brothers and sisters each child had.<sup>5</sup> The cases were collected from various parts of the United States and different economic status and would seem to represent the situation for the nation as a whole. Table 57 shows the results.

If allowed to continue unchecked for generation after generation, this decided tendency for the inferior to multiply more rapidly than the superior must inevitably result in a decline of the average intelligence level. It should be pointed out that the data collected in the Lentz study were taken on the children themselves; only families with children were covered, and cases of childless marriage were neglected. There is good evidence, however, that the people who have no children are superior in intelligence to those who have.



TABLE 57: *Relationship between I.Q. and Number of Brothers and Sisters*

NO. OF BROTHERS AND SISTERS	AVERAGE I. Q.	NUMBER OF CASES
0	107.9	415
1	105.6	865
2	101.5	772
3	97.4	689
4	94.3	516
5	91.8	398
6	88.8	242
7	92.1	181
8	85.5	126
9	84.7	67
10	83.9	25
11	82.6	19
12 or more	79.9	15

Bear in mind always that it is the parents of low native intelligence who have more children than parents of higher intelligence; it is not that having lots of children causes the children to be of low intelligence.

The situation which Lentz found to exist has been reported on the basis of many other studies. The differential birth-rate in the United States may be due in part to the fact of our very heterogeneous population. It happens that the Mediterranean immigrant groups, whom we have seen to be of inferior intelligence as a whole, have larger families than do the Nordic groups.

The population of Glasgow, Scotland, is certainly purer as to racial extraction than that of the United States. It is accordingly interesting to examine the results of a similar study made on the school children of that city. Dawson reports negative correlations between the number of children in the family and the intelligence of the school child tested.<sup>6</sup> The correlation between family size and intelligence of children, then, is a true one, possibly increased by the added factor of race differences but appearing even in a racially homogeneous group.

Conrad and Jones have given us a careful study of the problem of differential birth-rate in rural New England.<sup>7</sup> Their figures show no negative correlation between intelligence and family size.

They did discover a factor which has something of the same genetic significance. The poorer and less intelligent people started having children at an earlier age than the others. Although the size of the family did not vary with socio-economic status, the fact that successive generations were somewhat closer together at the lower end of the scale would produce a differential in favor of the poorer biological stock.

The intellectual fortunes of the human race are not quite as dismal as this discussion might appear to suggest. It is true that the stock of lower intelligence tends to reproduce more rapidly than that which is superior in intellectual endowment, but the results of a comprehensive investigation conducted by Thurstone and Jenkins indicates that this tendency is sharply reduced at the lower end of the distribution of intelligence by the fact that the extremely feeble-minded tend to be infertile.<sup>8</sup> The negative relationship between size of family and intelligence extends downward to I.Q.'s in the neighborhood of 55. Below that line the direction of the relationship is reversed; the size of the families of children below I.Q. 55 tends to decrease as average I.Q. decreases.

Thus we see that both euthenic and eugenic factors contribute to the intelligence level in a nation. Although the intelligence of an individual is determined mainly by heredity and remains more or less constant, the intelligence level of a group may change, owing to euthenic factors such as differential immigration and differential birthrate.

### *Social factors influencing character and personality*

To live in groups, people must follow certain laws of conduct. In the main our morality, conventions, and laws are useful in keeping one person from offending the tastes of another person or from violating his rights. Most of us accept the rules of our society because social approval will be denied us if we disregard them. Others ignore them, however, for various reasons. In this section you will see some of the conditions which are responsible for the development of non-conforming, immoral, or delinquent behavior.

Objective vs. effective environment. In our previous discussions of environment we have defined it in a statistical fashion. For example, in the studies on the contributions of heredity and en-

vironment to the development of intelligence, good environment was defined as one in which many material and cultural advantages, such as books, telephones, electric lights, pictures, etc., were present. A poor environment was one in which such things were relatively lacking. This definition is useful but not wholly adequate. Environment can also be defined as the set of conditions of living which really affect the growing individual. This effective environment is very hard to study, because we have no way of knowing which ones of the objective conditions of life are actually being reacted to. It may well happen that two individuals living in the same environment will develop along decidedly different lines because of some little accident which befalls one and from which the other is spared.

For example, James and John might be very similar in personality traits at the time they start to school. Suppose that James becomes ill and has to stay at home for a day or two. John is bitten by a dog on his way to school and arrives very much upset and frightened. The teacher calls on him to recite, but he is so disturbed emotionally that he forgets his lesson. Suppose that the teacher becomes sarcastic; points out that the brother at home is a much better pupil; or in some other way humiliates him. The other pupils take up the persecution on the playground. The term "Dumb Bunny!" is applied. John goes home crestfallen and timid. His brother is quick to take advantage of this fact to impose on him in various ways. Finding himself blocked on every hand, John turns to day-dreaming and fantasy for satisfaction.

Once the joys of day-dreaming have been discovered, John ceases to strive for the recognition and liking of his fellows. They soon forget him or think of him as a funny fellow who does not like to play. All of this builds up until John is definitely committed to the personality of the introvert. James, on the other hand, having conquered over John, is encouraged and reacts by dominating other children. In this case we see how two greatly different personalities can be developed in the same objective home environment.

The reality of the distinction between objective and effective environment becomes convincingly apparent when we examine the coefficients showing the degree of correlation between identical

twins in certain personality traits. You will remember that the correlation between the I.Q.'s of identical twins reared together was about .90. That means, of course, that identical heredity and identical objective environment working together produce a very high degree of resemblance in intelligence between the members of the twin pairs though not a perfect one even here. Carter conducted an investigation to determine and compare the correlations between twins for several personality traits.<sup>9</sup> Table 58 gives the correlations between the members of 55 identical twin pairs in six traits of personality as measured by the Bernreuter Personality Inventory. Notice that the identical twins do not resemble

TABLE 58: *Correlations between Members of Identical Twin Pairs in Six Traits of Personality*

TRAIT	CORRELATION
Neurotic tendency	.63
Self-sufficiency	.44
Introversion-extroversion	.50
Dominance	.71
Self-confidence	.58
Sociability	.57

each other nearly so much in personality traits as they do in intelligence. The conclusion from this comparison is that identical twins reared together may have different effective environments.

*Correlation between economic level and personality development.* Despite the considerations just discussed, psychologists and social workers have found repeatedly that there is a high degree of correlation between the social status and economic level of homes and the character and personality traits of children. The implication is that the conditions of the home are responsible for the development of the correlated traits of personality and character.

Careful case histories show that unfortunate home conditions typically precede the development of the undesirable traits of behavior in children. The cause always comes first in time. There is, of course, the hypothesis that defects in the home life as well as defects in the behavior of the children both proceed from some common cause, such as inferior native ability of the family strain. But efforts to improve the personality and character of children through the provision of wholesome social surroundings have been

so successful that psychologists, psychiatrists, and social workers are inclined to believe that the cause and effect relationship is that described by the first hypothesis.

"Do not deny your boy the privilege of suffering poverty," was the advice a prominent financier once gave to the parents of American college students. This advice was given by a man who felt that poverty brings out the best there is in one. How much basis is there for such a belief?

A. Emotional adjustment. In an attempt to answer this question, Stagner found that men students who reported having spent their childhood in poverty gave many more neurotic answers on the Bernreuter Personality Inventory than did those who came from more fortunate homes.<sup>10</sup> The same experimenter also found similar results in the case of women from poor, as compared with well-to-do, homes. Other traits of personality which correlated with particular economic conditions in the home were dominance, extroversion, self-confidence. In tests of all of these the students from the wealthier homes made higher scores. The notion that poverty presents a challenge to which the individual responds by developing a strong personality is not supported by any of Stagner's findings.

Brown has corroborated Stagner's results in a study of 712 children.<sup>11</sup> Emotional stability was measured by means of a self-inventory especially prepared for children. No relationship was found between emotional instability and either race or geographic locality. However, the emotional adjustments of children coming from homes of higher socio-economic level were superior to those of children coming from less fortunate homes.

B. Cheating in school. In an elaborate series of investigations into the factors in character development of children, Hartshorne and May discovered that children from poorer homes cheated more in classroom tests than those from the better homes.<sup>12</sup> Other results have shown that children from the poorer homes are more given to stealing than are those of the wealthier classes. We must consider here the factor of motivation of need. The wealthier children have many satisfactions both social and physiological which are denied the poorer ones. By consequence, in the same objective situation the poorer child would be more likely to yield to a given

temptation, for example, of keeping money found on the sidewalk.

The degree of correlation between the economic status of the home and the amount of cheating depends upon where the opportunity to cheat arises. Hartshorne and May found that cheating in school tests done at home on the "honor system" correlated  $-.43$  with economic status of the home; cheating in school also under the honor system showed a correlation between these same variables of only  $-.33$ . Since the groups were large, there is reason to believe that this difference, though small, is a real one (is reliable statistically). Economic status is less a factor in school cheating than it is in cheating at home. Apparently the public school acts as a leveling device in morals as well as in educational achievement.

c. Other character traits. *Self-control* was tested by presenting interesting distractions to children engaged in the performance of some duty. *Persistence* was measured by seeing how long children would continue to work at an unpleasant task. *Service* and *selfishness* were measured by noticing how much school work children would do when working for themselves alone as compared with working for a group or team. In all of these traits the poorer children were inferior to the more prosperous.

The "dog eat dog" philosophy of life seems to be engendered in children more by the conditions of poverty than by those of affluence. The poor child has to resort to fair means or foul to get what he wants. The child of well-to-do parents is in a position better to afford the luxury of morality, for it is less of a handicap to him in obtaining satisfactions.

*Character and nationality.* Hartshorne and May also studied the problem of possible nationality differences in amount of cheating. The racial and nationality groups studied were: North European, American, English, Jewish, Italian, Slavic, and Negro. They found that no differences in tendency to cheat existed between various pairs of different racial and nationality groups when the factor of economic level was held constant.

*Movies and morals.* The motion picture is the most popular form of commercial amusement in the United States today. Its popularity is rapidly spreading throughout the world. Is it possible to measure the effect that motion pictures have upon people?

Do the motion pictures have any effect other than that of temporary amusement which leaves the audience quite unchanged as it files out at the end of the performance?

These are questions which psychological research is prepared to answer. The motion pictures are capable of changing our attitudes toward social institutions, people, or commercial products. The direction of the change will, of course, depend upon the nature of the picture. The power of the motion picture to influence human behavior and beliefs is so well recognized that practically every civilized country in the world has some sort of censorship of motion-picture films. Sometimes the aim of the censorship is to prevent moral contamination of the audience, sometimes to prevent subversive political doctrines from gaining a foothold. No matter why censorship is imposed, the very fact that it is imposed is in itself an acknowledgment of a belief in the power of the motion-picture film to influence people.

How can we tell when people have been influenced by a motion picture? The easy way is to ask them. This the psychologist does, but he does it in a careful and systematic manner so as to prevent error of interpretation. He gets people to express their attitude toward a particular issue by checking a statement which best expresses their views or by ranking a group of persons, situations, or objects on the basis of goodness or badness, like or dislike, interestingness or dullness before and after having been exposed to the influence of the motion picture.

In one study on the effect of motion pictures on attitudes, a group of 240 school children were asked to rate the badness of several types of criminals, such as gangsters, bank robbers, kidnapers, bootleggers, etc.<sup>13</sup> An attitude scale was built up showing where each type of criminal stood in relation to every other. This scale showed the gangster to be the worst criminal in the pooled judgment of the subjects. The gambler was rated as midway between gangster and tramp in degree of badness.

The children then saw the motion picture *Street of Chance*, a dramatization of the evils of gambling. After seeing the film they again made ratings of the seriousness of the crimes. When these were compared with those made before, it was found that the rated badness of gamblers was increased. Here we have excellent proof



that the motion picture does change attitudes of children and hence can be an effective instrument in building the socially desirable attitude of condemning the practice of gambling.

Numerous other studies of a similar sort have shown that a wide range of attitudes can be significantly influenced by exposure to certain types of movies. The degree of permanence of such influence, especially when in the direction of altering attitudes already formed, has not been investigated as yet, but it seems from present information to be at least as stable as the learning of ordinary verbal material in the classroom.

We know that the motion pictures do influence people. Do our films, as a whole, influence people for the good or for the bad? This question is not easily answered, but it is an extremely important one.

Peters conducted an elaborate investigation to determine whether the content of the movies is in keeping with, or runs counter to, accepted modes of conduct.<sup>14</sup> The importance of such information is enormous, for if the movies consistently depart downward from the moral standards of our culture, they must be regarded as an essentially undesirable institution.

Several hundred subjects witnessed over a hundred commercial motion-picture films selected at random. The various scenes of the films were rated as above or below the generally accepted level of social conduct. The scale used to accomplish this was developed by the use of statistical procedures too involved to be described here. The ratings covered such departments of conduct as aggressiveness of a girl in love-making; kissing and caressing; treatment of employees and subordinates; racial discrimination; discipline of children; and many others. The results showed that most judges found the majority of the movie love scenes to be below the standard of social acceptance. In the case of democratic practices, however, the films set a standard of conduct which was slightly above the level of social acceptance. The parent-child relations shown in the movies were usually superior to the level of social acceptance. A final and very significant result of the investigation conducted by Peters indicates that those films which are farthest below the level of social acceptance are not the most successful financially. Virtue is better business than vice.

There is a strong temptation to jump to the conclusion that as a whole the movies exert a desirable influence upon people who see them. Peters' investigation shows merely that scenes depicting action which is superior to that approved by the average person are more frequent than scenes which are below the level of approval. It is quite possible that the smaller number of unapproved actions outweighs a larger number of approved actions in their influence on us. The burden of the proof, however, is on the person who takes such a point of view. Until proof to the contrary is available, we are not justified in looking upon the movies in general as a morally corrupting influence.

### *Delinquency and crime*

By delinquency we mean the types of socially non-conforming behavior, such as stealing, which will if detected lead to the juvenile court. Delinquency is an enormous social problem, because it has been clearly shown by many investigators to lead directly to adult criminality.

*How an individual becomes delinquent.* People behave in ways that give them the greatest reward. If the conditions surrounding the life of the growing child are such as to reward delinquent behavior, delinquency will result. The child who has once become delinquent is gradually withdrawn from the possibility of earning the rewards open to the well-behaved child. The delinquent child associates with other delinquents, he accepts their heroes and values, and as time goes on, it becomes harder and harder to appeal to him on the basis of the social approval of honest people. He now belongs to a small group within society whose ideals and laws are different from those of society as a whole. His loyalty is to this smaller group, and his first interest is in its approval of him. A well-known gangster once remarked that he would rather hire grown-up men to do his illegal errands than employ boys in their teens. The boys were too bloodthirsty. They were out to make reputations for themselves and would not hesitate to use rough tactics, even murder if the occasion seemed to demand it.

Burt made an elaborate study of the factors associated with, and presumably responsible for, delinquency in children.<sup>15</sup> His results have been verified many times by American investigators and are

used here because of his close adherence to the scientific method. He found that 18 per cent of his delinquent group came from poverty-stricken homes as against 8 per cent of a non-delinquent control group. He also found that defective marital relations of parents were twice as frequent for the delinquent as for the non-delinquent groups of children. This result was strikingly verified by Slawson for a group of American children.<sup>16</sup> This worker, in comparing 1649 delinquent boys with a much larger group of public-school children, found that "broken homes" were over twice as frequent among the delinquents as among the non-delinquents. Numerous investigators report that bad companions are one of the most important factors in leading a child into delinquent behavior.

Delinquency is highest in areas which are in a process of transition from residence to business and industry and are characterized by physical deterioration, decreasing population, and the breaking up of neighborhood culture and organization. These, of course, are low-rent neighborhoods.<sup>17</sup>

*Intelligence as a factor in crime and delinquency.* How many times have you read the equivalent of this in your newspaper?

MORON MOLESTS CHILD;  
ESCAPES POLICE DRAGNET;  
SHARP VIGILANCE KEPT

There is a profound feeling among laymen that crime and low intelligence go together, that feeble-mindedness and insanity are the same, and that sexual perversion is a sign of low intelligence. In this section you will see how much of this popular belief is grounded, how much ungrounded.

A. The intelligence of juvenile delinquents. Pintner has brought together the estimates of a number of authorities as to the proportion of delinquent children who are feeble-minded.<sup>18</sup> The figures run from 7 to 93 per cent. This lack of agreement among experts has many explanations. In certain communities the children of the better families never get before the juvenile court, no matter what their crime. The parents are well known and influential and are trusted to handle their delinquent children in their own way. Under such circumstances only the children of poor and

uninfluential families of low intelligence would get before the court. In looking over the literature on this important topic, however, one comes to the conclusion that low intelligence is just one factor in delinquency and by no means the most important one.

Such factors as poverty, broken homes, bad companions, and mental conflicts seem far more important than low intelligence as causes of juvenile delinquency. This fact is fortunate from the social point of view, for these factors are ones which can be dealt with within the life of the individual by euthenic measures, such as better schools, supervised play, or improved economic conditions in the home. Were native intelligence the fundamental factor in delinquency, the outlook would be much less hopeful.

B. The intelligence of adult criminals. Pintner also reviews data gathered on delinquent soldiers during the World War who were confined in army guard-houses or in Fort Leavenworth, a federal prison. The Fort Leavenworth prisoners were slightly superior to the average of the army draft, and the men sentenced to the guard-house were slightly inferior. The Leavenworth prisoners were men convicted of serious crimes, whereas the minor delinquents were placed in the guard-house. These data imply that intelligence plays an important rôle in escaping apprehension and conviction. The men of lower intelligence are probably more frequently caught than those who are brighter, when apprehension depends upon routine methods. In the case of the more serious crimes where greater effort is expended in detecting the guilty persons, the brighter men as well as the duller are brought to justice. There is the alternative, of course, that brighter men commit more serious offenses than do the duller ones, who might lack the imagination or opportunity to carry out a really serious crime.

Murchison has given us a very comprehensive study of the intelligence of convicted criminals.<sup>19</sup> The average intelligence of convicts of five states was compared with that of the white draft of the World War for the same states. The results indicate that there is essentially no difference in intelligence between the convict and the draft groups. The average convict is no less intelligent than the average man.

In a study based on a group of nearly 1000 Minnesota state prison convicts Kuhlmann found these convicts to be much lower

than the average of the state in intelligence level.<sup>20</sup> Obviously the question of the relationship between intelligence and criminality is influenced by selective factors which operate differently in the various convict populations. At best, intelligence can be considered as only one of a large number of factors influencing criminality.

Are we safe in assuming that *convicted* criminals are on the average inferior in intelligence to those whose crimes never catch up with them? If so, then we must conclude that the average intelligence of criminals as a whole is superior to that of law-abiding men. Obviously the problem of eliminating crime and delinquency cannot be fruitfully attacked through efforts to eliminate feeble-mindedness from the race.

Table 59, based on Murchison's report, shows that the type of crime for which a man is convicted is related to his intelligence. According to this table, persons convicted of embezzlement are considerably more intelligent than most criminals. The reason for this is obvious. To get into a position where embezzlement can be committed means that the man has, preceding his fall, demonstrated ability to discharge responsible duties. The treasurer rather than the janitor is the one who gets a chance to steal the company's money.

*Some curative measures.* Criminologists are coming more and more to the opinion that an habitual criminal is almost hopeless of rehabilitation. Students of delinquency and crime are agreed that prevention should start early if it is to be effective.

The determination of the causes of delinquent and non-conforming behavior is merely the first step. The next step consists in manipulating the conditions of the lives of the delinquent children in such a way as to steer their development into socially acceptable channels. The tendency of children to form gangs results in evil consequences only when that gang activity is not intelligently directed. The influence of good companions is for the good, just as evil companions influence in the opposite direction. Such organizations as the Girl Scouts, the Boy Scouts, the Y. M. C. A., and various church organizations can direct the gang spirit into useful activities. Such organizations do much to prevent children from becoming delinquent, and juvenile delinquency from passing into outright adult criminality.

TABLE 59: *Average Intelligence of Convicts in Ohio, Illinois, and Indiana Prisons, Listed According to Crime Committed*

CRIME	MEAN INTELLIGENCE TEST	
	SCORES (ARMY ALPHA)	NUMBER OF CASES
Conspiracy	86	17
Embezzlement	82	19
Confidence game	79	31
Assault and battery to rob	73	35
Robbery	69	516
Forgery	69	179
Burglary of inhabited dwellings	67	40
Issuing fraudulent checks	66	15
Larceny	66	721
Violation of automobile law	66	37
Pocket picking	65	46
Vehicle taking	62	60
Burglary	62	773
Entering to commit felony	60	42
Murder in the first degree	58	221
Assault to murder, rape, or rob	55	108
Bigamy	53	18
Rape	50	102
Abandonment	49	48
Sodomy	46	25
Carrying concealed weapons	45	47
Manslaughter	42	78
Incest	41	25
Murder in the second degree	37	97
Cut, stab, shoot to kill or wound	34	51
Vagrancy	12	16
AVERAGE	62	TOTAL 3367

Slum-clearance projects typically provide for playgrounds with adequate equipment and competent supervision. Children who find interesting play in the open are not likely to resort to hide-aways in vacant tenement buildings and abandoned stores or factories.

Organized social work is doing a great deal to prevent delinquency by providing experts who can call at homes to determine

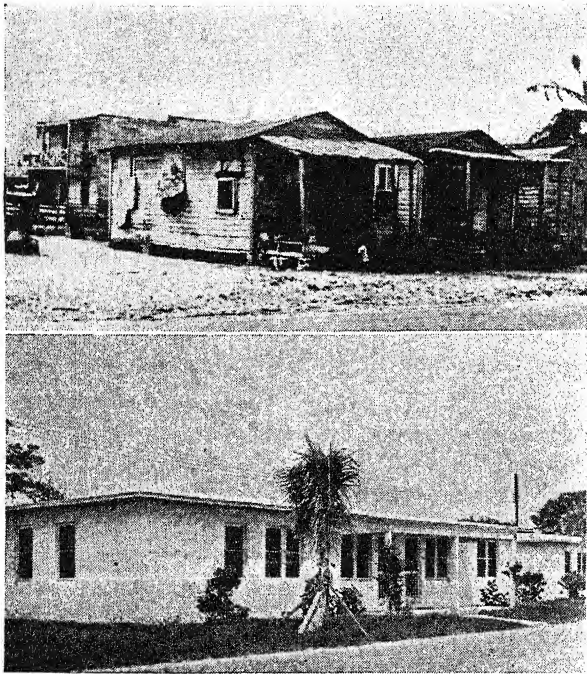


FIGURE 74. *The path toward delinquency and crime often starts in the dark and dirt of squalid homes. The Federal Government's low-cost housing projects, bringing sun and beauty to poor places, have sprung from an appreciation of the rôle housing plays in the health and wealth of a nation. While a good house will not necessarily make a good family, social surveys show that it will be a great help.*

the causes of the first symptomatic outbreak. Frequently study of the home situation leads to recommendations and adjustments which save a child from the reformatory. Another promising idea is that of the Big Brothers. This organization provides that some business man or professional man of standing in the community take an interest in a socially underprivileged child and, as the name suggests, be a big brother to him. The adult sponsor helps the child find part-time or full-time employment, depending upon the child's age, and advises him with regard to important personal problems. The big brother serves as an example and an inspiration for the underprivileged boy.

The attitude of the juvenile courts toward delinquency has changed greatly in the present century. The judge of the juvenile court tries to become an expert in human adjustment. He attempts to give guidance to the erring youth and looks upon punishment as the last resort. The modern judge of a juvenile court charges himself, his organization, and society as a whole with a failure each time a child is sent to the reformatory.



*Psychology and education*

The social problem of educating the children and the adults of this country and of the world is an enormous one. If all educative influences are grouped together, the training of people is one of the biggest industries. The greatest achievements of applied psychology are in the field of education.

America is justly proud of her widespread school system. In no other country is an education quite so easily obtained. We can well be proud of the part that public education has played in raising the standard of living in the United States above that found in any other country. We have not gone all the way, however. There are still too many persons of high ability who, because of poverty, are denied opportunity for education commensurate with their ability. A thorough-going system of education conceived as a eutheic program must eliminate such cases. An educated citizenry is essential to effective democracy.

Who shall receive an education? Certain interpretations of the democratic principle hold that all persons are created equal and hence that all persons are equally entitled to a free education provided at public expense. The experience of mankind shows that this interpretation can never be put into practice. However, as we have already seen, there are individual differences in the ability of human beings to learn, just as there are individual differences in any other human trait. To attempt the education of those who cannot profit from instruction is futile. The limiting factor of intelligence cannot be ignored. One of the most significant problems which higher education faces at the present time is that of selecting the most promising learners. Many of our great private universities have long exercised their right to pick and choose. The state-supported institutions have quite naturally been slower in adopting such measures. Some of them have, however, made considerable progress in this direction with gratifying success.

Numerous studies have been made on the problem of the relationship between intelligence as measured by standardized tests and educability as measured by subject-matter tests and school marks. The results show that intelligence plays an important rôle

in determining school grades in elementary school, high school, and college. There is a decided tendency for the correlation between marks and intelligence to be highest in the elementary school and lowest in college, with high school intermediate. There are many reasons for this. In the first place, the pupils in the lower grades represent practically the entire range of individual differences in intelligence. As they grow older, they are subjected to more and more selection as the less intelligent either drop behind or leave school to go to work. Secondly, as education advances, it becomes more and more specialized, and by consequence scholastic success comes to depend more upon special abilities and less upon general intelligence. Then, too, in the lower grades the hours of working are held rather constant for all children. At the high-school level this is less true. The college student has more freedom to regulate the amount of work he does. The student of poor intelligence can compensate for his weakness by working hard.

Dickson (and hundreds of others) have successfully used the Stanford-Binet to foretell what kind of work a child will do in school. As you might predict, from your study of the I.Q., it is much more important to know the child's mental age than his chronological one. The correlation between Stanford-Binet mental age and quality of school work is .72.<sup>21</sup>

*Sectioning on the basis of ability.* Results of this sort have led to the practice of sectioning pupils on the basis of mental age. The children in the school system are tested to determine their mental ages. Then those of about the same mental age are put together in classes for instruction. Such a procedure enables the teacher to adjust the methods of presenting the subject-matter to the intellectual abilities of the pupils. Thus the brighter students are prevented from being bored by too simple a course of study, and at the same time the duller ones are protected from being embarrassed by failure to master subjects which are beyond their comprehension. This practice of selecting and sectioning on the basis of intelligence is carried all of the way up to the college. Because of the excessive cost of higher education the problem of eliminating the unfit becomes crucial at that level. That intelligence as measured by tests is an important factor in scholarship is shown by the following figures taken on students at the University

of Illinois. Let us follow the scholastic fortunes of 113 students in the lowest 10 per cent on the basis of an intelligence test and those of the upper 10 per cent on the same test as shown in Table 60.

TABLE 60: *Records at the End of the First Semester of the Upper and Lower Ten Per Cent (of the Distribution of Intelligence) in a Group at the University of Illinois*

RECORD	% OF	% OF
	POOREST TENTH	BEST TENTH
Withdrew before the end of the semester	12	4
Were dropped by the university	24	0
Were placed on probation	37	2
Made average grades or better	10	84

As we have seen in Chapter 12, there are certain special aptitudes, such as mechanical ability, which bear no relationship to the kind of intelligence required in the mastery of academic subjects. Modern educational practice is providing opportunity for individuals with such abilities in special courses in vocational work which prepare the pupil for some skilled trade which lies within his abilities. There are, of course, a few individuals who are poor in both general intelligence and special aptitudes. For these the school can do little beyond teaching reading, writing, and simple arithmetic useful in daily living. Such pupils eventually find their place as unskilled or semi-skilled laborers.

Woodrow conducted a carefully controlled experiment to see if likeness in learning ability is a function of likeness in mental age.<sup>22</sup> A group of average nine-year-old children were compared with a group of children of the same *mental age* but ranging in chronological age from ten to sixteen years. In other words, a group of children of average I.Q. were paired with a group of older children of the same mental age and consequently lower I.Q. The two groups were put through a learning experiment under carefully standardized conditions. This experimental set-up is adequate to reveal whether learning of the particular subject-matter used, sorting geometrical forms, depends upon mental age or upon I.Q. It was found that the results were identical for the two groups. Consequently we must conclude that learning ability depends upon mental age and not upon I.Q. Accordingly, we conclude that

sectioning of young children in schools must be done on the basis of mental age rather than intelligence quotient.

Suppose that we should wait one year and then put the same two groups of children through a similar learning task. Which group would do better? The two groups were equal in M.A. at the time of Woodrow's experiment. The average nine-year-olds, being those of higher I.Q., would develop at a faster rate; thus they would have the higher average M.A. one year later and would therefore learn faster.

From this discussion, we must conclude that an adequate program of sectioning school children on the basis of mental age must provide for frequent regroupings. A group of children of the same mental age but differing chronological ages will gradually become a group dissimilar in learning ability.

*Other plans for sectioning.* There are certain defects in the practice of sectioning students on the basis of ability. Since individual differences are great, certain very bright students will be much younger than other duller ones of the same mental age. Putting such individuals together results in a group which is quite mixed in degree of emotional maturity. Recent experience in education indicates that too great emotional differences in a group are just as harmful as too great intellectual differences. Certain plans attempt to get around this difficulty by treating the classroom situation in one way and the playground situation in another way. Children of equal mental age learn together; children of equal emotional age play together. This compromise has not proved entirely satisfactory. Progressive education attempts to make the classroom activity as strongly social as that of the playground. Considerations such as this have led to the development of a still newer practice in education, that of grouping children of the same emotional and chronological age together in the classroom but at the same time providing for individual intellectual differences by a several-track course of study. The brighter pupils are permitted to go more deeply into the subjects in which the duller students are expected to learn merely the essential and useful fundamentals.

*The technique of teaching.* Psychology has made so many contributions to the technique of teaching that it is quite difficult to give

anything but a rough outline in a book of this sort. One of the outstanding contributions of modern psychology to education has been a shift of emphasis from teacher responsibility to pupil responsibility. In the old days the teacher was a drill master who felt obliged to make the pupil learn "or else." The content was logically presented in the textbooks or in the classroom. Sentences were designated by the teacher or the author as worthy of being committed to memory. Examinations required that the learner give back those words of wisdom in a letter-perfect fashion. The pupil was not held responsible for the understanding of the materials learned, was not required to see new relationships between the old ideas; neither was he encouraged to apply his learning to life situations.

The researches of modern psychology have shown clearly the futility of such educational practices. In the so-called progressive schools of today the learner is given great freedom of movement. He is permitted to study in his own way problems which strike him as being vital. Of course the teacher does some unobtrusive directing and stimulating of interest but is not heavy handed and stern as formerly. The interesting thing is that the children who are permitted to learn by studying problems of everyday life usually end by learning more of the solid subject-matter than those who are forced to study that subject-matter logically presented. The philosophy of education represented by the slogan *learning by doing* is a very real contribution of the psychological approach to the social problem of education.

It is, of course, true that the lack of drill-sergeant methods places greater demands upon the personality of the teacher. Any adult can force smaller or younger people to sit at attention and recite in parrot-like fashion the words of some authority, but real leadership is required to stimulate and direct the interests of students into productive fields of inquiry. The modern teacher is more like a diagnostician than a gang boss. Students are encouraged to learn, while the teacher stands by to help them locate and overcome their difficulties. There are available for each of the fundamental school subjects various types of diagnostic tests which will reveal the weaknesses of the learner to both himself and his teacher. Such tests are frequently accompanied by special drill materials which enable the student to iron out his difficulties.

Educational psychology has contributed greatly to the efficient preparation of textbooks and of courses of study. Careful analysis has shown that certain concepts within a subject ought to be delayed a year or two to permit the student to achieve greater intellectual maturity; others can be moved up a year or two. The modern writer of textbooks attempts to include only material which has utility and to present it in the order in which it will be easiest to learn. The old notion that study of certain subjects which lack utility but are logically presented can strengthen the mind is no longer accepted by educators and is no longer practiced to the extent that it formerly was. The evidence with regard to this interesting problem was reviewed in Chapter 10.

That the school should give all of its time to the three R's is an outworn tradition. The modern school recognizes that children must be socialized. They must be taught to get along with others. They must be prepared for the duties of citizenship. Psychological investigations have shown that mere knowledge is no guarantee of good citizenship and morality. The school of today recognizes in its practices these fundamental psychological truths.

The various applications of psychology to education have tended in the main toward regarding the learner as more important than the subject-matter. Loyalty to the subject-matter is secondary to loyalty to the student as a member of society. Enlightened public opinion is the bulwark of democracy.

### *The Voice of Democracy—Public Opinion*

PUBLIC OPINION has been referred to by the philosophers of the past as the "voice of God." Others have called it the "mutterings of a beast." In America it functions as the "voice of democracy," choosing leaders and deciding questions of public policy. In a democracy public opinion both influences and is influenced by its leaders. In a totalitarian state it merely is influenced—by fear and force when persuasion fails.

On election day the vast American public goes to the polls to put its opinions on record, and it then abides by the majority decision for a set period of time. Under a dictatorship, however, a change is possible only through revolt.

### *Characteristics of public opinion*

The most striking characteristics of American public opinion are its tremendous power and the fact that it changes in a slow and predictable way.

*Public opinion is powerful.* Public opinion sets codes of behavior, formulates standards of morality, establishes rights and principles under which people must live. It is a sort of supreme court of society. Not so long ago women wore their hair long and did not smoke cigarettes. A woman who either bobbed her hair or smoked cigarettes was suspected of easy virtue. If she did both, the facts were considered conclusive.

In America we have certain laws, conventions, mores, and attitudes, which prevail because public opinion accepts them as right. When public opinion decides they are wrong or inadequate, they are changed accordingly. Contrast this with the situation existing in totalitarian countries. Public opinion has no such power there. Laws, conventions, and mores may or may not be in accordance with the will of public opinion; where they are not, the people have no power to change them.

The first characteristic of public opinion in this country, then, is that it is the principal power which governs all our social and economic life.

*Public opinion changes in a predictable way.* Public opinion is not static. It changes. What was "wrong" at one time becomes "right" at another. This is illustrated by the change in public opinion with regard to cigarette smoking by women.

After the first World War, a few daring ladies decided to bob their hair; some decided to smoke cigarettes. Then followed domestic commotion throughout the land. Sermons were delivered on the subject from pulpits. Mothers who had daughters threw up their hands in despair and wondered what the younger generation was coming to. Soon, however, nice ladies followed the lead of the daring ones. What at one time had been regarded as immoral came to be accepted by public opinion.

Countless surveys over the past few years show that public opinion is not fickle; it is not left today and right tomorrow; it does not say "yes" this week and "no" the next. It changes, but it changes



gradually. Rapid, cataclysmic reversals in the attitudes and opinions of people are exceptions rather than the rule.

### *How public opinion changes*

We have seen that public opinion is constantly changing. What are some of the forces responsible for this change?

*Responsiveness to social suggestion.* Many investigations have been made to determine the effect of suggestion on our thoughts and actions.

A. Majority vs. expert opinion. Marple reports an experiment in which he measured social influence of majority and expert opinions in terms of the number of reversals of judgment they occasioned as compared with the number that might have been expected by chance.<sup>23</sup> Three hundred high-school seniors, 300 college seniors, and 300 representative adults were asked to indicate their attitude toward seventy-five controversial questions concerning socio-economic problems, touching on the fields of education, politics, and ethics. Such statements were included as, "The installment plan of buying has done more harm than good to the stability of American economic life." On the first presentation, subjects were simply asked to check "Yes," "Uncertain," or "No."

One month later one third of each of the three groups repeated the test with exactly the same conditions as on the first occasion, providing a control group. A second third of each group were given questionnaires in which the majority opinion for each statement had been circled in green. The remaining third of each group were given questionnaires in which expert opinion (the composite vote of twenty individuals from public life or university faculties) had been circled.

Both majority and expert opinion influenced the subjects in each age group, and in each case majority opinion was found to be the more effective of the two. The greatest influence shown was in the case of the high-school students, where majority opinion was responsible for four times as many reversals of judgment as occurred in the control group, who were subjected to no social influence of any kind.

Marple's results are in agreement with other experiments directed along the same lines and indicate that we can change peo-

ple's opinions by showing them that other people think differently about the subject. It is well known by salesmen that popularity of a product is a strong talking-point. We all have a tendency to believe what we are told that other people believe.

B. Effect of admiration or dislike for the authority. Saadi and Farnsworth conducted a clever experiment to show whether we are more inclined to accept the statements of people we like and admire than those of persons for whom we have less regard.<sup>24</sup> A list of names of public persons was given to a group of college students, who were asked to indicate their like or dislike for each of them. The ten names which received the highest degree of liking were as follows in order of decreasing liking: (1) Twain; (2) Jordan (the beloved President of Stanford University, where the experiment was conducted); (3) Edison; (4) Will Rogers; (5) Einstein; (6) Keller; (7) Darwin; (8) Aristotle; (9) Lindbergh; (10) Woodrow Wilson. The list of names least liked by the students included those of: Aimee Semple McPherson; Queen Marie of Rumania; Al Smith; Billy Sunday; "Big Bill" Thompson; W. M. "Boss" Tweed; Rudy Vallee; Pancho Villa; William Randolph Hearst.

The subjects were then given a list of statements such as the one shown in the following example. Part of the subjects received lists in which a particular statement was attributed to a liked person; part received the same statement attributed to a disliked person; the remainder received the statement not attributed to anyone.

"There is nothing sacred about the American Constitution. If it doesn't serve its purpose, it should be changed as often as necessary." (Following this the name of its supposed maker.)

The students studied a list of statements of this sort and indicated quantitatively their degree of acceptance by means of the following key, in which a low number means a high degree of acceptance:

1. Absolute and complete agreement.
2. Partial agreement.
3. Undecided; not ready to express an opinion.
4. Partial disagreement.
5. Absolute and complete disagreement.

The results for a particular statement show the trend of the total results. The exact statement cannot be quoted here, since it would be unfair to attach any such statement as was shown in the example above to the name of a person who really did not make it. Statement X was given an average acceptance rating of 1.78 when attached to the name of Lindbergh; 1.97 when attributed to nobody; and 2.16 when attributed to the less liked Hearst. As a whole the results permit us to conclude that we accept statements more whole-heartedly when they come from people we admire than when they come from people we dislike.

This fundamental fact of psychology has many applications in life. If you want to move people to action or conviction, tell them of liked persons who hold the views you are fostering. Advertisers have long used endorsements by celebrities to sell their products. The efficacy of this practice may be assumed to be exactly proportionate to the degree to which those persons are liked or disliked by the public for which the product is intended. Since, however, endorsements are frequently given by people in return for cash considerations and not because of any great liking by the endorser for the thing endorsed, it is wise to protect oneself against exploitation by inquiring into the authenticity of the endorsement, if possible, or, better still, basing a purchase on a critical tryout of the product itself. At a recent athletic demonstration a well-known athlete who has endorsed a brand of cigarettes was asked by the crowd to exhibit the package from which he took the cigarettes he smoked during the rest periods. This critical attitude on the part of the buying public, if it becomes sufficiently widespread, as indeed it appears to be becoming, will eventually destroy the effectiveness of testimonial advertising.

c. People differ in their responsiveness to social pressure. Not all people are equally influenced by the opinions of individuals or of their group as a whole. The writer recently conducted an experiment to find out to what extent people's judgments of the frequency of usage of certain words are influenced by supposed knowledge of the judgments of the group as a whole.

A group of over two hundred college students received a test made up as follows:<sup>25</sup>

## WORD-USAGE QUESTIONNAIRE

Look at the words in capitals and then look at the four words in small letters which follow. You will notice that one of the four words in small letters is always underlined. Such underlining indicates that most people vote that word to be the most frequently used equivalent of the word in capitals. Examine each of the words in capitals and then look at the four words which follow it. If you agree with the majority of people that the underlined word is the most frequently heard equivalent of the word in capitals, draw a circle around it. If you think one of the words not underlined is more frequently heard as an equivalent of the key word, draw a circle around that one instead. This is a study in the growth of the English language.

ACKNOWLEDGE	pay <u>answer</u> thank reward
ADVENTURER	deceiver gambler <u>traveler</u> experimenter
ANALYSIS	<u>experiment</u> arrangement inquiry reasoning
APPRECIATE	know <u>approve</u> measure realize
ARBITRARY	irregular lawless authoritative <u>severe</u>

The words were underlined purely by chance. This was done so that the indicated answer would vary from the correct to the incorrect. The evidence of group pressure would be clearest when the word underlined in the test form as that given by most people is really the one with the least frequent usage. Some of the subjects agreed with every word; a few never agreed. That these individual differences in suggestibility are real was shown by the fair degree of reliability of the test. One-half of the test agreed with the other to the extent shown by a correlation coefficient of .86. Had the response of the subject been due to chance, this correlation coefficient would have been zero. The scores on the social-suggestibility test (labeled word-usage test to disguise its real purpose from the subjects) were correlated with scores earned by the students on intelligence tests; with grades in school subjects; with two measures of emotional stability; and with degree of right-handedness. All of the correlations were zero. The person who is influenced by group pressure would not seem to differ in the respects listed from those who refuse to accept or act upon the supposed knowledge of what most people say.

In a second experiment with this test, a group of college fraternity men and a group of sorority members rated each other on the basis of contrariness in social relations, after which the "word-usage test" was given to them all. In general, the students who refused to accept the suggestion on the word test were the ones rated by their fellows as contrary or negativistic. Evidently individuals do differ in the extent to which they are inclined to hold out against social pressure. It is interesting that women, who are traditionally supposed to be more suggestible than men, earned the same average score as the men in this test.

The average person was more disposed to accept suggestions than to resist them. Since the marked answers were assigned by chance to one of four possible responses, the person who was neither suggestible nor negativistic would agree with the suggestions exactly twenty-five per cent of the time. Actually, the average person in the group studied agreed forty per cent of the time. In other words, the average college man or woman is decidedly willing to follow the crowd in his or her judgments as to the frequency of word usage. Similar tests have been devised using other objects of judgment, such as size of irregular areas, resemblance of ink-blot to known objects, and the like. The results are in agreement with those for the word-usage judgments.

*Influencing people through words.* Man is a talking animal. Ability to talk, even more than his erect posture and free use of the hands, sets man apart from the lower animals. We might even think of the ability to talk as that which makes the man. More recently man has learned to set his talking down on paper so that it can be read by himself or others. Through written and printed records man is able to pass down his discoveries to subsequent generations in a way that mere word-of-mouth records could never equal. Language is an essential part of the cultural influence which surrounds the growing child. Conversations with friends in which ideas are exchanged and criticized, public lectures, books, magazines, and more recently radio communication have done and are doing much to steer the development of human societies. So accustomed are we to language set down graphically that we are justified in feeling contempt for the ancient monarch who opposed the introduction of writing on the grounds that it would weaken

human memory. Spoken and written language is a cultural achievement for which we are truly thankful.

Words play so important a part in our development that we can scarcely conceive of being without them. In an earlier chapter you saw how words can become the conditioned stimuli for emotions and drives. You have also seen that words can become substitute responses taking the place of overt acts. Through these conditioning processes words acquire power to control human behavior in a very real way. In advertising alone the bill for written and spoken words is two or three billion dollars per year in the United States. Add to this the enormous significance of written and spoken language in poetry and prose literature which gives human beings so much enjoyment, the widespread practice of education, which again deals largely in words, and you cannot doubt that man is truly a talking animal.

In this section you will learn more about the use of words for influencing people. Through words people can be made to do what is good for them; through words they can be exploited into wasteful and otherwise harmful practices.

"It stands it so in the print," says the foreigner, revealing the important rôle played by the printed word in directing his behavior and that of the native as well. Business men have long recognized the value of printed messages in influencing people to buy their products. Salesmanship-in-print is not new, but it has never lost its power when skilfully used. When he came into office (1932), President Roosevelt showed his respect for the power of the press by having an aide conduct a clipping service in which all comments favorable or unfavorable were collected and classified to use in shaping his administration policies.

The power of the printed word probably lies in the fact that so much of importance has been printed. We have read so many interesting, true, and worth-while things that the mere fact that an idea is expressed in print gives it the air of being interesting, true, and worth while.

A. The importance of wording. The same idea may be expressed in several equivalent ways, but certain groups of words will be much more effective in catching and holding the attention of the reader, in convincing him, or in inciting him to action.

The Little Blue Books are published by a firm which specializes in small reprinted editions of well-known literature. This company experimented systematically on the effect of the wording of titles on the sale of their books.<sup>26</sup> Whenever it was found that a particular book was not selling well, its title was changed in a manner calculated to increase the interest of the reader. Its price remained the same. This was quite easily accomplished, since the books published are ones upon which the copyrights have expired and are by consequence public property. The following table showing differences in sales volume as a function of the wording of the title is interesting and instructive. Remember that the story or content of the book is always the same. Merely the titles are

TABLE 61: *Effect of Change of Title on Yearly Sale of Fifteen Books*

OLD TITLE	YEARLY SALE	NEW TITLE	YEARLY SALE
<i>The Tallow Ball</i> (Maupassant)	15,000	<i>A French Prostitute's Sacrifice</i>	54,700
<i>Privateersman</i>	7,500	<i>Battles of a Seaman</i>	10,000
<i>Fleece of Gold</i>	6,000	<i>The Quest for a Blonde Mistress</i>	50,000
<i>The Mystery of the Iron Mask</i>	11,000	<i>The Mystery of the Man in the Iron Mask</i>	30,000
<i>The King Enjoys Himself</i>	8,000	<i>The Lustful King Enjoys Himself</i>	38,000
<i>None beneath the King</i>	6,000	<i>None beneath the King Shall Enjoy This Woman</i>	34,000
<i>Ten O'Clock</i>	2,000	<i>What Art Should Mean to You</i>	9,000
<i>Markheim</i>	Few	<i>Markheim's Murder</i>	7,000
<i>Pen, Pencil, and Poison</i>	5,000	<i>The Story of a Notorious Criminal</i>	15,800
<i>"Patent Medicine" and the Public Health</i>	3,000	<i>The Truth about "Patent Medicine"</i>	10,000
<i>Art of Controversy</i>	Few	<i>How to Argue Logically</i>	30,000
<i>Nietzsche: Who He Was and What He Stood For</i>	10,000	<i>The Story of Nietzsche's Philosophy</i>	45,000
<i>An Introduction to Einstein</i>	15,000	<i>Einstein's Theory of Relativity Explained</i>	42,000
<i>The Truth about Mussolini</i>	14,000	<i>The Facts about Fascism</i>	24,000
<i>Poems of Evolution</i>	2,000	<i>When You Were a Tadpole and I Was a Fish</i>	7,000



changed. A careful study of the changes will show that the more successful titles are the ones which emphasized sex, self-improvement, and people.

B. Pleasant and unpleasant words. There are many examples in the English language of words which mean the same or nearly the same but which differ markedly in their emotional effects upon us. Notice the following examples.

<i>Pleasant or neutral</i>		<i>Unpleasant</i>	
saliva	portly	spit	fat
dish cloth	decayed	dish rag	rotten
odor	intoxicated	smell	drunk
inexpensive	intestines	cheap	guts
slender	later maturity	skinny	old age

It is possible to express distaste for a thing or person without in any way violating the objective facts merely by making use of words with an unpleasant affective tone. For example, to call a girl slender is more flattering than to call her skinny. Logically, a *handsome* man is the same as a *pretty* one, but most men would prefer the first adjective. Through judicious attention to the pleasantness or unpleasantness of words we can influence people to accept our likes or dislikes.

There are a very few words in the English language that are truly onomatopoeic, i.e., suggest by their very sound the sounds for which they stand. Samples of onomatopoeic words are: splash; bark; caw; tinkle; squawk; babble. Such words by virtue of this quality may be pleasant or unpleasant even to a person who does not understand the English language. Most words, however, are unpleasant because the idea for which they stand is unpleasant and not because of any native unpleasantness in the sound of the words themselves. The emotional value of words usually depends upon the type of associations which we have formed in the past.

Thorndike asked a large group of subjects to judge a series of words as to pleasantness or unpleasantness on the basis of sound alone.<sup>27</sup> They were told to disregard completely the meaning of the word in making their judgments. The subjects as a whole preferred such words as *coral*, *swan*, *serene* to such other words as *belch*, *waddle*, *squawk*, *wart*. Although their preferences for cer-

tain of these meaningful words were distinct, they showed no preference when given nonsense syllables to judge. Obviously, we are influenced by the meaning of words even when we try to disregard it.

A Frenchman who did know English once said that he regarded the word combination *cellar door* as among the most beautiful in the English language. Most of us would regard it as rather commonplace. Likewise, the familiar real estate agent's sign FOR SALE struck a French visitor to New York as particularly unpleasant. The French words *fort* (t not pronounced) *sale* mean *very dirty*.

c. Stereotypes in thinking. Hartmann conducted an investigation which indicates that voters at the polls vote for party names rather than for the actual issues represented.<sup>28</sup> House-to-house interviews were made in an agricultural county in Pennsylvania in which voters were asked to indicate their party preference and also to reveal their attitudes toward a number of political issues such as government ownership of railroads, reduction of huge fortunes, government old-age insurance, worker-ownership of industry, and many others. There were twenty statements in the questionnaire, the acceptance of ten of which would indicate thoroughgoing radicalism and ten of which, if accepted, would indicate conservatism. The majority of the group of 168 representative citizens in the community studied—farmers, miners, laborers, small shopkeepers, housewives, and clerks—accepted more radical statements than conservative ones. Yet this group of voters whose attitudes were fundamentally liberal or radical put the Republican party first and the Socialist party much lower in their preference. Apparently the name Socialist has an emotional connotation which makes it unpleasant even to the person whose political views are more or less in agreement with the platform of that party.

*Propaganda and education compared.* The aim of propaganda is to change people in some way: to make them buy a certain thing or vote a certain way. To change people is also the aim of education. By education, however, both in the schools and outside them we in this country attempt to give children and adults the knowledge, skills, and ideals which will be useful to them in getting the answer for themselves. Thus we see that propaganda

and education differ from one another, for us at least, in the goals toward which they are directed. Propaganda usually exploits; education must serve.

But there is a more important difference in this country. Propaganda is aimed at getting action or conviction no matter by what means. Consequently, propaganda calls on emotion and prejudice as often as it appeals through logical analysis—or oftener. Education in America, on the other hand, strives to equip the individual with the *techniques for getting* the right answer himself. Educators hope that once these techniques are mastered—once the person learns to think—he will get his own answers and that they will usually be right.

*The techniques of propaganda.* Propaganda, or the deliberate attempt to influence the thought and actions of others, is a potent force in our life today. Most striking, of course, is the high-powered political propaganda which we regard as highly undesirable. Propaganda is not all of this type, however. Advertising employs propaganda, as do missionary work, trying to sell tickets for a dance, raising a fund for a scholarship or memorial, teaching a child good manners, or rehabilitating criminals. Any attempt of any individual or group to promulgate ideas or induce certain action is propaganda. In reforms it is an extremely desirable force. It is unfortunate only when the aim is contrary to public interest and when the interested group, eager for results, employs dishonesty or other undesirable means in its effort to attain its aim.

There is no set of rules which will automatically equip a person to write effective propaganda. Such propaganda, however, has certain characteristics. Dunlap has analyzed the art of propaganda and gives as his result the following rules.<sup>29</sup>

1. If you have an idea to put over, keep presenting it incessantly. Keep talking (or printing) systematically and persistently.
2. Avoid argument, as a general thing. Do not admit there is any "other side"; and in all statements scrupulously avoid arousing reflection or associated ideas, except those which are favorable. Reserve argument for the small class of people who depend on logical processes or as a means of attracting the attention of those with whom you are not arguing.
3. In every possible way, connect the idea you wish to put over with the known desires of your audience. Remember that wishes are the basis of the acceptance of ideas in more cases than logic is.

4. Make your statements clear and in such language that your audience can repeat them, in thought, without the need of transforming them.

5. Use direct statements only when you are sure that a basis for acceptance has already been laid. Otherwise, use indirect statement, innuendo, and implication. Use direct statement in such a way that the attention of the audience shall be drawn to it sufficiently to take it in but not sufficiently to reflect upon it.

6. For the most permanent eventual results, aim your propaganda at the children; mix it in your pedagogy. Follow the example, in this respect, of the successful propagandists of the past.

To what extent is the teacher justified in using the techniques of propaganda as a part of his or her teaching procedure? The writer has found from a number of years of teaching experience that even the college student is not always a rational being. He is often more easily swayed by his emotions than by facts. The popular teacher is all too often one who takes advantage of this condition. In the last analysis, however, good teaching should never rely on the methods of propaganda beyond the first step of gaining the student's attention. It should aim not only at telling the student what to do but should strive as well to show the student how he can discover for himself what to do. Propaganda, as we have seen, is not concerned with such aims.

*The power of propaganda.* In this day and age the media for the dissemination of propaganda are legion.

Propaganda may be launched by the person-to-person technique known as the "whispering campaign." The whispering campaign has a certain effectiveness growing out of the fact that its content is passed in such an informal way that the hearer never thinks of questioning the source. There is in the United States today a firm which contracts to carry out whispering campaigns by spreading certain stories that are helpful to one manufacturer or injurious to a competitor. The organization maintains a staff of people in various parts of the country who release their "copy" in their casual social conversations, giving it the motive force of interesting news fresh from the source. This practice is a dangerous one, for such stories can easily get out of hand. Also there is the difficulty of checking the source of the message, a condition which invites unscrupulous advertisers to release all brakes and launch

the wildest and most damaging kind of propaganda in an attempt to serve their special interests.

Of recent years the radio has assumed an ever more important position among the media of communication—and of propaganda. The Presidential campaign of 1936 was of considerable interest to social psychologists, because it was to some extent a test of radio vs. newspapers as agencies for effective political campaigning. Most of the important newspapers of the United States were frankly unfriendly toward President Roosevelt in their editorials and, in some instances, even in their news. Many students of politics felt that it would be impossible for Roosevelt to win against such widespread opposition. His strongest publicity weapon was the radio, by which his talks reached millions of voters. Of course, there were many other issues determining the final outcome, but the landslide to Roosevelt in the election of 1936 shows that the newspapers are not the overwhelming and all-powerful influence that they have often been regarded. The election of 1940 was pretty much a repetition of the 1936 story.

The daily newspaper and the magazine in addition to their constructive functions are the traditional media for the dissemination of propaganda of all types. Even if we cannot be certain that the press is mightier than the microphone, we can certainly grant that the press is a mighty influence in shaping the opinions of people and in directing their action. Although in real life it is difficult to eliminate all of the factors operating to influence people's attitudes, in the laboratory these variables can be brought under control. The experiment of Annis and Meier shows what can be accomplished in the way of scientific study of the power of the press.<sup>30</sup>

In this experiment one large group of college students were given editorials to read which were favorable to Hughes, the Prime Minister of Australia during the World War; other students were given editorials unfavorable to him. A preliminary test revealed that the subjects of this experiment had never heard of Mr. Hughes prior to the experiment. The favorable and unfavorable editorials were printed in *The Daily Iowan* and were in the same style and of the same length as its usual editorials. The students in the experimental groups were given their copies of *The Daily Iowan* at the beginning of a class hour and asked to read

only the editorials. They were requested not to look at the paper again. Fifteen favorable and a like number of unfavorable editorials were "planted" in the *Iowan* and given to the subjects throughout the course of the experiment. The favorable editorials pointed to Mr. Hughes as a strong advocate of those things which students hold to be desirable; the unfavorable editorials showed that Mr. Hughes was against such things. At the end of the experiment an attitude scale was given to the subjects to determine how favorable their opinions were toward Mr. Hughes. Ninety-eight per cent of the students who had read the favorable editorials were biased in favor of Mr. Hughes. Of the group who had read the unfavorable editorials, 86 per cent were biased against him. When the attitude scale was given after an interval of four months, the bias of each group was almost as strong as it had been at the end of the experiment.

Journalists will object if an impression is given by the foregoing discussion that newspapers are simply means of creating bias and prejudice in the minds of their readers. Newspapers are also important means of educating people. The ethics of journalism demand that the facts be given, even though they hurt some party or person. It sometimes happens in the life situation that the journalist is forced to suppress news or alter it to give a propaganda value favorable to some interest or loyalty. Such practices are undesirable, for the success of a democracy depends upon an educated and intelligent electorate in full possession of the facts.

### *Measuring the minds of the millions*

Clever politicians have long recognized that successful leadership consists largely in giving people what they want. Even the leader cannot be independent of public opinion. This is true not only in the field of politics but in business, in education, and in almost every activity in which we indulge. Thus it becomes of critical importance that we devise ways to determine what public opinion is on any given subject. The familiar polls of election years conducted by magazines or large newspapers are attempts to measure public opinion in advance of public action on the assumption that the one will predict the other. Such material is high in reader interest, and agencies have sprung up which measure public

opinion on all manner of issues and topics and at all times rather than only before election. The demands for accurate measurement of public opinion and mass behavior have been so great that many psychologists and others have worked hard to develop adequate methods in this important field. In this section we shall review some of their problems and accomplishments.

*Getting a fair sample.* The problem of getting a sample of people who will represent all people is one of the most important in the whole field of measuring popular reactions. The correct sample in an opinion survey must reflect every kind and condition of individual in the total population. Each age, sex, income, and



FIGURE 75. Here an interviewer gets in statistical form the opinions of Ben Fawcett of Erie County, Ohio, who has been statistically selected as a representative office worker. Obviously there is a personal contact in such cases—but there's a statistical control for that, too.



racial or religious group must be represented in accurate proportion. A straw ballot cannot go out to the fifty million voters of the United States. The cost would be prohibitive. Suppose, however, that a list is made up and a straw ballot is sent by mail to some of the voters. Even then only a small portion of them will return the ballot. Can we assume that those who were not interested enough to return the ballot are no different in their opinions from those who did return the ballot? Here we have two fundamental problems of selection. It was upon these snags that *The Literary Digest* poll was caught in the presidential campaign of 1936, when it predicted "Landon by a landslide" and missed the popular major-party vote by 18.5 per cent. It had obtained its list by random selection of names from telephone directories, which, however, do not represent a fair sample of the voting population. *The Pathfinder* experienced a similar fate in the presidential election of 1940. In both cases, the lists were weighted too heavily in the direction of higher economic groups where the Republicans had the greater following. This is one acceptable explanation of the first serious failure of these magazines to predict the outcome of a presidential election with a fair degree of accuracy. Another factor is that the party in power at the moment tends to feel complacent and is not moved to register an opinion in the form of a mailed ballot. Cahalan and Meier have shown that both of these factors operated in the 1936 *Literary Digest* poll.<sup>31</sup>

Shuttleworth reports an experience typical with the use of the mailed questionnaire.<sup>32</sup> An attempt was made to get questionnaires returned by 327 technology majors who had been graduated from the College of the City of New York in 1936. Through various high-pressure tactics, such as registered letters and personal interviews, all but four of the 309 whose addresses could be determined returned information. The first 184 returns showed 0.5 per cent unemployed. The succeeding 121 returns taken by themselves showed 5.8 per cent unemployed. Likewise it was found according to early returns that 15.4 per cent were employed outside the field of their training. Later returns, however, showed 29.6 per cent employed outside their field of training. Of the 22 of the original 327 who were not contacted, it is reasonable to suppose that the vast majority either were unemployed or were employed in lines

so remote from their training that they could not be traced. Suppose we were to accept the figure on unemployment based on the first returns, as is common practice. Our error would be enormous.

The mere accumulation of numbers of cases will not compensate for bias in the sample. A straw vote of 1,000,000 unrepresentative people will come no closer to representing the vote of the nation as a whole than would a straw vote based on 1000 unrepresentative people. The practical problem of getting a fair sample is a highly technical one, requiring the use of numerous techniques developed by experts in the field.

The American Institute of Public Opinion, known as the Gallup poll, and the magazine *Fortune* were successful in predicting the outcome of the presidential election of 1936, because they used methods of sampling which were more representative than those employed by *The Literary Digest* which built its list from telephone and automobile owners. Also they used trained interviewers who talked personally with men and women of all social and economic classes. The less favored groups were questioned as well as the more favored. The personal interview method of polling public opinion has a further advantage over the mailed questionnaire in that a large percentage of attempted personal interviews are completed, whereas a very small return on mailed questionnaires can be expected.

*How to ask the question.* The second big problem in opinion polling is how to ask the question. Experience in measuring public opinion has shown what the psychologist discovered in the laboratory, namely, that the form of the question can greatly influence the response. Logically equivalent questions are not psychologically equivalent. The changing of a few words can influence the results as much as 10 per cent. For example, the question, *Do you prefer the brand X fountain-pen to others?* was answered *yes* by 20.6 per cent of the students in a large lecture section. When a comparable group of college students were asked, *What brand of fountain-pen do you prefer?*, 42.5 per cent replied brand X. A *yes* answer to the first question is the logical equivalent of saying "brand X" in reply to the second, but the two are different psychologically. A possible explanation of this discrepancy may be found in the tendency of the first question to make people assume a

critical attitude. They had to be certain that they preferred the brand X before replying *yes*. In the second question the critical attitude was not suggested. The second form of the question is the better one, since it leaves the subject free to answer in the absence of positive or negative suggestion and without assuming a critical attitude. The second form of question taps an area of uncertainty which is suppressed by the critical attitude suggested by the first question.

In a nationwide study by Raslaw, Wulfeck, and Corby, two logically equivalent questions were asked of strictly comparable groups.<sup>33</sup>

Do you like the idea of having Thanksgiving a week earlier this year?

Yes: 16.7 per cent.

Do you like President Roosevelt's idea of having Thanksgiving a week earlier this year?

Yes: 21.4 per cent.

The results leave little doubt that logically equivalent questions are not always psychologically equivalent. The inclusion of the name of the President lent the prestige of his high office to the affirmative answer.

The art of asking questions is a subtle one, but there are certain rules which will help if applied.

A. Make the question short and phrase it in simple language so that even uneducated people and people of limited intelligence can understand it. A question which seems obvious and is easily grasped by the average college student may not be fully comprehended by the less gifted. Most people will not ask for an explanation when they do not understand but will give some answer merely to conceal their lack of understanding.

B. Avoid leading questions. If you want to know what brand of canned soup a person bought last, ask: *What brand of canned soup did you buy last?* Never ask: *Did you buy brand X canned soup last?* Even worse is the following form: *Didn't you buy brand X canned soup last?* The last two questions suggest the answer. Whether the subject reacts positively or negatively to the suggestion is immaterial, for either type of reaction would decrease the accuracy of the replies elicited. In general, however, people are

more likely to react positively than negatively to such suggestion.

c. Don't ask too many questions. The interview or questionnaire should be short. If an interview is too long, the subject will become tired or bored and will give ill-considered answers just to get through with the whole thing.

d. Phrase the question in such a way as to produce answers that can be easily tabulated and compared. If the results of several thousand questionnaires or interviews are to be summarized, it is necessary to resort to simplified tabulating procedures. In general the questions should be of such a nature that they can be answered *yes* or *no* or by supplying a name or a short phrase. For example, the Psychological Corporation, a group of professional psychologists who have contributed heavily to the development of technique of measuring public opinion, found the following form of question to be effective in measuring the attitude of the public toward the problem of unemployment relief: *Do you believe that your city, state, or federal government should take care of unemployment relief?*<sup>34</sup> Had the question been phrased more generally as, *What do you think about unemployment relief?* the answers would have been too vague for accurate tabulation and analysis.

Current practice in measuring public reactions leans heavily toward the technique of a preliminary poll, or "test-tube" survey, in which the most frequent answers are discovered. Often these answers are made up into a check list on which the subject can indicate the view that he finds most acceptable. Another advantage of the test-tube study is the discovery of sources of error which can be eliminated by different phrasing of questions.

*How accurate is the public opinion survey?* It is difficult to discuss the accuracy of public opinion surveys with regard to particular commercial products, for such information must be kept confidential to protect the interests of the firm for which the survey is made. In one case, however, a sampling survey on brands of automobile tires in use agreed to within one-tenth of one per cent with actual sales figures.

It is easier to investigate the accuracy of political polls. In 1936 the Gallup poll missed the actual major party vote by 6.6 per cent. The following table shows the final figures reported by the Gallup and *Fortune* polls in 1940.

TABLE 62: *Accuracy of Fortune and Gallup Polls in 1940 Presidential Election*

SECTION AND STATE	ROOSEVELT PERCENTAGE OF MAJOR PARTY VOTE				
	<i>Latest Avail- able Figures</i>	<i>Gallup Report</i>	<i>Error</i>	<i>Fortune Report</i>	<i>Error</i>
<i>New England</i>	52.9%	50.5%	-2.4	48.4%	-4.5
Maine	48.5	43	-5.5		
*New Hampshire	53.2	49	-4.2		
*Vermont	45.1	42	-3.1		
Massachusetts	53.4	51	-2.4		
Rhode Island	56.8	54	-2.8		
Connecticut	53.6	53	-0.6		
<i>Middle Atlantic</i>	52.6	49.5	-3.1	48.1	-4.5
New York	51.9	49	-2.9		
New Jersey	51.9	52	+0.1		
Pennsylvania	53.7	49	-4.7		
<i>East North Central</i>	51.0	47.8	-3.2	47.0	-4.0
*Ohio	52.2	49	-3.2		
Indiana	49.4	45	-4.4		
*Illinois	51.2	48	-3.2		
Michigan	49.9	48	-1.9		
*Wisconsin	50.9	48	-2.9		
<i>West North Central</i>	48.4	46.6	-1.8	41.6	-6.8
Minnesota	51.6	51	-0.6		
Iowa	47.9	45	-2.9		
Missouri	52.5	49	-3.5		
North Dakota	44.3	46	+1.7		
*South Dakota	42.6	41	-1.6		
Nebraska	43.1	41	-2.1		
Kansas	43.2	43	-0.2		
<i>South Atlantic</i>	68.2	68.1	-0.1	76.0	+7.8
Maryland	58.9	59	+0.1		
Delaware	54.1	56	+1.9		
West Virginia	57.3	59	+1.7		
*Virginia	68.3	70	+1.7		
North Carolina	75.9	72	-3.9		
South Carolina	95.3	97	+1.7		
Georgia	85.6	87	+1.4		
Florida	73.7	72	-1.7		

TABLE 62—*Continued*

SECTION AND STATE	ROOSEVELT PERCENTAGE OF MAJOR PARTY VOTE				
	<i>Latest Avail- able Figures</i>	<i>Gallup Report</i>	<i>Error</i>	<i>Fortune Report</i>	<i>Error</i>
<i>East South Central</i>	67.8	66.1	-1.7	80.4	+12.6
Kentucky	57.5	54	-3.5		
Tennessee	67.9	64	-3.9		
*Alabama	85.6	86	+0.4		
*Mississippi	95.8	94	-1.8		
<i>West South Central</i>	73.3	73.0	-0.3	81.5	+8.2
Arkansas	79.8	82	+2.2		
*Louisiana	85.9	86	+0.1		
*Oklahoma	57.6	56	-1.6		
Texas	80.9	79	-1.9		
<i>Mountain</i>	55.1	51.7	-3.4	45.1	-10.0
Montana	60.0	57	-3.0		
Idaho	54.8	49	-5.8		
Wyoming	52.8	53	+0.2		
Colorado	46.9	45	-1.9		
New Mexico	56.4	53	-3.4		
Arizona	64.4	61	-3.4		
Utah	62.3	55	-7.3		
*Nevada	60.1	56	-4.1		
<i>Pacific</i>	57.8	56.0	-1.8	50.8	-7.0
Washington	57.7	57	-0.7		
*Oregon	54.1	54	-0.1		
California	58.4	56	-2.4		
<i>NATIONAL TOTAL</i>	54.6	52.0	-2.6	55.2	+0.6
Average state error			2.4		
Average sectional error			2.0		7.3

\*1940 official election returns.

In its final estimate released to the press the Monday morning before election day *Fortune* magazine reported Roosevelt at 55.2 per cent on its question: "For whom do you expect to vote in November—Roosevelt or Willkie?" Since Roosevelt received 54.6 per cent of the vote, the *Fortune* figure scored an error of 0.6 per cent. The average *Fortune* error for the nine census sections was 7.3 per

cent. Inasmuch as *Fortune* overpredicted Roosevelt in the South and underpredicted him in the North, these sampling errors tended to cancel out in the national figure.

Gallup gave a final figure, which was 52 per cent for Roosevelt in the nation—an error of 2.6 per cent. Gallup's average error by states for the 48 states was 2.4 per cent; for the nine government census sections it was 2.0 per cent.

The public opinion survey has proved itself so valuable in business and journalism that we may reasonably expect that it will be employed by governmental administrators of the future in determining public policy and in deciding at what time to launch projects which depend for their success upon receptive public opinion. One of the serious objections to the democratic form of government has been that the election system is slow and cumbersome. The duly constituted representatives of the people have often been obliged to cast their votes in real ignorance of the wishes of their constituents. It is not difficult, however, to visualize a plan whereby a government agency could conduct unofficial surveys based on house-to-house interviews at critical times during the periods that representative bodies are in session. Such a plan would enable the legislator to represent his constituents much more effectively and would go far to increase the efficiency of the democratic form of government.

Is there a "band-wagon vote"? We have seen that group opinion often exerts considerable influence upon the individual's opinion. Among the serious criticisms of polls is the suggestion that voters may be influenced by the knowledge that a particular candidate or issue is winning. If true, close governmental supervision of polls might well be justified to see that unscrupulous pollers do not deliberately publish false results to influence an important election. This problem of the band-wagon effect is a special aspect of the influence of the group opinion on the opinion of the individual which must be considered in detail. The evidence is interesting but not conclusive.

In the period from 1920 to 1932 the *Literary Digest* poll was widely read. It enjoyed an enormous prestige, due to the size of the sample used, running as it did into millions of the more prosperous and influential members of society. Its accuracy was



taken for granted. It successfully predicted the Presidential elections of 1920, 1924, and 1928. In 1932, however, its sweeping, confident, and much publicized prediction, "Landon by a landslide," was followed not by a Republican victory but by a Democratic one. "As Maine goes, so goes the nation," became "As Maine goes, so goes Vermont." The enormous prestige of the *Literary Digest* poll did not create enough of a "band-wagon" effect to swing the election.

If the band-wagon effect were stronger than all other factors, or if other factors were equal and even a slight band-wagon factor were working, a candidate once in the lead would increase his lead more and more until all of the "pick the winner" voters had jumped on. This was certainly not the case in the Presidential election of 1940. Let us look at the facts as released and published in some 120 newspapers in the United States from the time of the conventions until election day.

TABLE 63: *Voting Plans of Those Favoring the Two Major Party Candidates in the Election of 1940, As Reported in the Gallup Poll* (Actual vote for Roosevelt, 54.6%; for Willkie, 45.4%)

DATE	% INTENDING TO VOTE FOR ROOSEVELT	% INTENDING TO VOTE FOR WILLKIE
August 4	51	49
August 25	51	49
September 20	55	45
October 6	56	44
October 18	55	45
October 27	54.5	45.5
October 30	53	47
November 3	52	48

We start with Roosevelt slightly in the lead and he increased it, just as the band-wagon effect would have it. On October 18, however, Roosevelt lost some of his lead to Willkie. The evidence from the Gallup poll supports the notion that people jump *off* as well as *on to* the band wagon.

In 1936 two psychologists measured the effect of knowledge of the *Literary Digest* poll results on a group of 349 students.<sup>35</sup> The following explanation and instructions were given:

"As an extension of the Presidential polls conducted by the papers of Pioneer Hall and Sanford Hall, you are asked to coöperate in a straw vote.

"Polls of this kind are being conducted all over the country. The largest of these polls is the *Literary Digest* poll with a total of over two million votes. As you probably know, Landon is leading in the *Literary Digest* poll with a total of fifty-four per cent of the votes cast. Roosevelt is second with a total of forty per cent.

"You simply fill in your choice for President, your school and your class on these ballots. Do not write your name. Indicate your sex by printing M or F for male or female.

The control group received the same instructions except that paragraph two telling about the *Literary Digest* poll was omitted.

There was a slightly higher Landon vote in the experimental than in the control group, but it did not meet the conventional test of statistical significance. The band-wagon effect was not demonstrated but, of course, it was not disproved, either.

A weakness of the above experiment is that many of the subjects had *already* been influenced by knowledge of the *Literary Digest* polls in their outside contacts and that repeating this information to the experimental group was "throwing salt in the sea." To avoid this source of error, another experiment was conducted by the same workers. Subjects indicated whether or not they were familiar with the results of the *Literary Digest* poll. Sixty subjects who did not know of the poll and fifty-seven who did, all of whom voted for Roosevelt in the experimental straw votes, were then told of the *Digest* results. The percentage of unacquainted who subsequently shifted to Landon was not significantly greater than that of the acquainted group.

Although the question is still an open one, we are not safe in concluding that the band-wagon effect is an important determiner of voting behavior in either real elections or straw votes. The evidence so far indicates that political opinion is probably not highly subject to band-wagon effects but is motivated by other factors.

### *Psychology and War*

THE FIRST CONTRIBUTION of psychology to practical affairs which received wide attention in the United States was the testing of the soldiers during the World War. It should not be concluded that

psychology's contributions to the social problem of war are limited to the selection of efficient soldiers. But since in any war this is an important problem, it will be discussed first; then we shall go on to see why men go to war and whether psychologists believe there is an instinct making war inevitable. We shall also see what some of the other problems of adjustment are during a war.

*Who shall go to war?*

Shortly after the United States entered the World War, the American Psychological Association voted to offer the services of its members to the cause. The contributions of psychology and of psychologists were many and varied.<sup>36</sup> The biggest single achievement was the preparation of intelligence tests to be used in the selection and placement of soldiers.

By conservative estimate, the time required for the administration of a reliable test of intelligence is about thirty minutes. An individual intelligence test such as the Stanford-Binet (see pages 487-488) takes longer and requires a trained psychologist to administer it. Obviously this type of testing could not be employed with the great masses of drafted men who kept pouring into training camps. Two group tests of intelligence were developed to meet these demands. One, the Army Alpha, is a group test of intelligence for individuals who can use the English language. It is composed of material which is encountered in the course of informal contacts with American culture, such as reading newspapers and magazines, listening to public addresses, attending the elementary public schools, talking with people, and keeping one's eyes open generally. In technical terms it is a "verbal" test, because it employs language in the giving of directions and in the performance of the tasks of the test.

The Army Beta was developed to provide a means of measuring the intelligence of foreigners and illiterates for whom the use of the Alpha scale would not be fair. The test battery was made up of a series of seven tests printed in a folder. Each of the tests consisted of a series of drawings or diagrams which could be understood by the subject without use of verbal instructions. The "answers" did not require the use of language, and the directions were given by pantomime sometimes accompanied by verbal di-

rections in a foreign language. In administering the Army Beta, many a psychologist had his opportunity to prove his prowess as an actor.

Psychological work in the army extended from September, 1917, to January, 1919. Psychological units were established in thirty-five camps and were responsible for the testing of 1,726,966 men, either by means of individual tests or by The Army Alpha or Army Beta. The psychologists recommended on the basis of their test findings that 7800 men be discharged for mental defects, that 10,014 men be placed in labor battalions because of mental defects which rendered them unable to learn the duties of the common soldier, and that 9486 men be placed in developmental battalions for training and observation for possible use in the army. The contributions of intelligence testing to the winning of the war did not cease there. Frequent use of the intelligence-test scores was made in selecting the more gifted men for officers' training courses, in determining the promotion of officers, and in selecting special detachments for paper work.

In addition to the development of intelligence tests for the selection of recruits, the psychologists studied the problem of emotional instability as related to war service in an attempt to prevent or cure it. At the present time men are being rejected who are nervous and emotionally unstable. Detailed studies were made also of the sensory equipment of aviators and others required to make accurate observations of space and objects. But the most lasting outcome of the psychological activity during the World War was the development of the group methods of intelligence testing. The use of group intelligence tests has spread widely to education and to industry as a result of the impetus given by the gigantic testing projects of the war.

*Is there an instinct which makes war inevitable?*

Popular belief has it that war is an inevitable social phenomenon because of some instinct of pugnacity which makes men want to turn upon one another with intent to destroy. The belief in an instinct for war seems, at first sight, to get some support from observations upon animals. Certain species of animals obtain food by killing some weaker animal. Other animals will fight back or even

kill when badly frightened, even though they will not eat the flesh of the victim. Moreover, history shows that man has often fought wars. Is this sufficient evidence to justify the notion that men and nations go to war because of some instinct to fight?

Fletcher asked the members of the American Psychological Association to answer the following question: "Do you as a psychologist hold that there are present in human nature ineradicable, instinctive factors that make war between nations inevitable?"<sup>37</sup> Seventy per cent of the members responded as follows: no, 346; yes, 10; unclassified, 32. These figures leave little doubt as to the psychologists' verdict. In their opinion the social evil of war must be attributed to something other than an instinct of men to fight.

The question as to why we go to war is really two problems. The first problem is concerned with why nations go to war, the second, with why individuals go to war, once their country is involved. So far, unfortunately, beyond the negative fact that the instinctive hypothesis is not valid in accounting for a nation's going to war, the psychologist has little to contribute to the first problem, which is, of course, by far the larger of the two problems. The story of why individual men go to war is more confidently told. Some men, of course, fight because it is their chosen way of earning a living or because the army is the only job open to them. Probably the chief reason men fight is that they are convinced that the security of their homes, families, and way of life is in danger. As you have already seen, too, people work for social approval and to avoid scorn. If going to war will get social approval, the normal man will go to war. But there is more involved in the personal psychology of war than the desire to obtain social approval and avoid scorn. Many young men are bored by the dullness of their existence. Others are in such deep mental conflict that life seems little worth living. To both groups war is an opportunity for honorable escape which is so inviting that the dangers are forgotten. The hampering conventions and obligations of peace time are thrown away for a hectic and almost hysterical wartime freedom. Voluntary enlistment "for the duration" is frequently an externalization of the individual's self-dissatisfaction. The enemy becomes the scapegoat for one's own feelings of inadequacy. As such, it is like many other aggressive acts.

### *Morale in wartime*

Morale is the dominant attitude of a group in relation to a common goal. When morale is high, men and women will work hard and suffer privation, danger, and death. High morale is a shared eagerness to do a job with confidence of success.

Modern military experts consider morale to be more important than equipment in the long run in making for successful military operation.

The creation and maintenance of high civilian morale is also of extreme importance. Various techniques for the creation of good morale may be employed. Some of these are mere applications of the propaganda art. The following rules are examples of this superficial type of effort.

(1) Fasten the war guilt on the opposing nation. Think and talk of the war as a defensive war.

(2) State the war aims in terms acceptable to all: security, peace, honor, justice. Stress unity.

(3) Build up friendships. Play down religious, racial or class differences, and hatreds.

(4) Show instances of the enemy's depravity and cruelty.

(5) Show signs of confidence. The "can't lose" philosophy is essential to victory.

(6) Attribute unfavorable news to cunning lies of the enemy.

(7) Illustrate competence of leaders, President, general staff, etc.

(8) Suppress news that weakens morale.

The "word magic" described above may have some place as a purely emergency measure, but high morale in civilian groups and armed forces will build up solidly and permanently only when all people are convinced that the dignity of human life and the rights of men are in danger. A democracy will live just as long as it provides—or is obviously doing its best to provide—its members with the basic materials and values of the good life. Unemployment, poverty, ill health, crime, and insecurity are bad morale factors and must be eliminated if high morale is to be achieved.

The word magic has its only important benefit when directed against the enemy. Some rules for an effective morale offensive follow.

(1) Undermine the enemy's confidence in its leaders. Show Hitler to be a cringing, whining neurotic; that Mussolini has a weak heart as a result of syphilis.

(2) Show the enemy its cause is hopeless. Magnify its losses; minimize your own.

(3) Divide the enemy. Set the Jews against the Christians; the Protestants against the Catholics; the whites against the colored.

(4) Discredit the enemy in the minds of the neutral nations.

Even as an offensive against an enemy, word magic is of dubious value. Just wars are fought not to destroy an enemy but to protect one's own rights. The aftermath of a just war is a fair and realistic settlement with the vanquished, which in turn builds toward active coöperation among the nations concerned. Word magic which wins a war may lose the peace to follow.

Morale among the armed forces is affected by the way men are recruited for service. At first sight it might appear that volunteer armies would, on the whole, have better morale. Experience during America's participation in the World War, however, indicated that the units made up of drafted men were more efficient and had better morale than those composed of enlisted men. There are several reasons why. Conscription, by and large, is a better way than enlistment recruiting for raising an army in a national emergency. (1) Conscription is quicker. (2) It relieves the conscriptee of any moral sense of obligation to his family or even to his own selfish interests. To enlist at a sacrifice causes conflict. If one is drafted, there is no choice and no conflict. (3) Conscription encourages the fatalistic philosophy so valuable to the soldier under fire. "If my number is up, I am going,"—going to camp or going to death—it is the same fatalism of the good soldier. (4) Conscription is more democratic. Drafted armies cut a fair cross-section of young men. The rich, the poor; the good, the bad; the bright, the dull are forced together until they stratify out on the basis of their "soldiering" ability.



Psychologists have studied some of the more pressing social problems. Their results indicate that the quality of the human race can be improved through eugenics (the control of heredity

through selective breeding) and through eugenics (the improvement of the environment). Intelligence of future generations can probably best be improved through encouraging parents of superior intelligence to have large families, for their children will tend to be of superior intelligence also. Present indications are that the level of intelligence in the United States is declining slowly because of the differential birth rate which favors faster reproduction of less intelligent individuals.

Character and good conduct are much more dependent upon the quality of one's environment than upon the quality of one's heredity. Whereas feeble-mindedness can be reduced by selective breeding, crime and delinquency should be tackled by improving the environment of the individual. Some of the environmental factors most adverse to the development of good character and conduct are poverty and defective family relationships, such as quarreling parents and divorced or separated parents.

Since public education is one of the greatest of the eugenic efforts in the United States, psychologists have made many attempts to apply their science to the practice of education. One of the central problems in education is how to meet individual differences. Children of similar mental age, regardless of their chronological age, learn at the same rate. It has been suggested that children be grouped together on the basis of mental age. This plan is faulty because the children so grouped vary enormously in their emotional maturity. The best current practice groups together children of the same degree of emotional maturity and provides richer curricula for those of superior intelligence.

Efficient operation of a democracy implies a rapid and accurate communication between the people and the government. The public-opinion poll can supply this need. Opinion polls are accurate if the people whose opinions are asked represent in true proportion every element in the general population and if the questions are carefully phrased to avoid bias and suggestion. Public opinion is influenced by many things other than facts themselves. We tend to accept a statement that represents a majority opinion or one that appears to come from an expert or from some individual whom we respect and admire. Propaganda attempts to get individuals to do a certain thing and chooses whatever means is most



effective at the moment. Education, in America at least, differs from propaganda in that it strives to equip people with the skills for determining the best course of action for themselves.

Psychology contains much that is useful in understanding the causes of war and in recruiting and training successful armies. Through the use of psychological tests the unfit can be eliminated from a group of recruits. Psychologists are convinced that there is no human instinct of pugnacity which makes wars inevitable. Good morale in war time will occur when most citizens are agreed that an enemy is attempting to rob them of their basic human rights.

### *Recommended Readings*

BEAN, L. H. *Ballot Behavior*. American Council on Public Affairs, 1940.

How elections can be predicted by a simple procedure on the basis of past voting behavior.

CANTRIL, H., *et al.* *The Invasion from Mars*. Princeton University Press, 1940.

A psychologist studies the panic created by Orson Welles's broadcast.

DOOB, L. W. *The Plans of Men*. Yale University Press, 1940.

The author applies the techniques of the psychologist to social problems. Of unusual interest.

DURBIN, E. F., and BOWLBY, J. *Personal Aggressiveness and War*. Columbia University Press, 1939.

A strongly psychoanalytic analysis of men's motives for going to war.

LYND, R. S., and LYND, H. *Middletown; a Study in American Culture*. Harcourt, Brace, 1937, and *Middletown in Transition; a Study in Cultural Conflicts*. Harcourt, Brace, 1937.

A typical American community is surveyed before and after the depression.

OSBORN, F. *Preface to Eugenics*. Harper, 1940.

The evidence from biological, sociological, and psychological studies are woven into a fair and realistic treatment of eugenic programs.

ROBINSON, C. E. *Straw Votes*. Columbia University Press, 1932.

A pioneer study by a leader which is as true today as when it was written ten years ago.

SHAW, C. R. *The Jack-Roller*. University of Chicago Press, 1930.

A story of a delinquent's career in crime and his reformation, told by himself.

STANLEY, L. L., and WELLS, E. *Men at Their Worst*. D. Appleton-Century, 1940.

The chief surgeon at San Quentin gives you case-histories and opinions on crime and punishment.

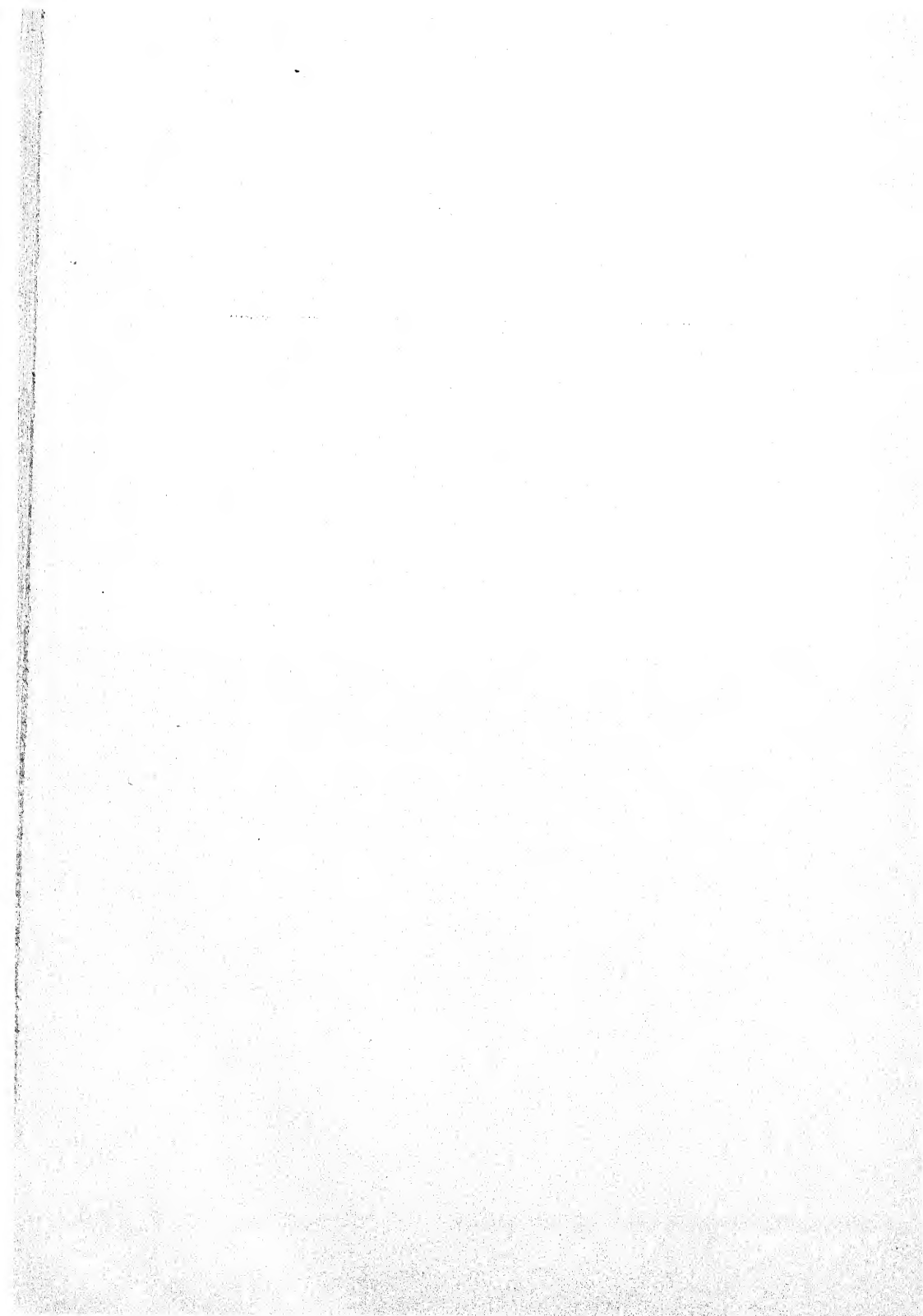
TULCHIN, S. H. *Intelligence and Crime*. University of Chicago Press, 1939.

Detailed conclusions resulting from the giving of intelligence tests to 10,413 inmates of penal institutions.

PART FIVE

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*Physiological  
Backgrounds*



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CHAPTER 17

## THE FORM AND FUNCTIONING OF THE NERVOUS SYSTEM

*Without the nervous system there is no mind. How the different parts of the nervous system work alone and together.*

THE PRECEDING chapters of this book have been devoted mainly to the description of behavior and consciousness and the conditions under which they occur. The aim of psychology has been presented as essentially practical. In keeping with that aim the writer has emphasized such conditions of behavior and experience as are directly or indirectly controllable by the individual himself or by the social group. Little has been said about the nervous system and other physiological foundations of psychology, for there is little that the student can do in the way of manipulating those conditions in the interest of effective adjustment to the world in which he lives. The human body is a complicated affair. The physician alone is permitted to tamper with it.

You, a student about to complete your first course in psychology, are in possession of many facts about the behavior of people; you have, it is sincerely hoped, developed an interest in the

subject-matter which will motivate you to get farther below the surface than we have thus far descended. You can well demand more of the *why's* of human behavior. Everything we do or feel is accompanied by some event in the nervous system. Although there are many well-established psychological facts that cannot yet be explained on the basis of the known facts of neurology and physiology, each day brings news of the advancement of knowledge. Tremendous victories have already been achieved, and the future promises many more to come. Let us look into some of the more interesting and well-explored mechanisms underlying our behavior. In so doing it will be necessary to examine in some detail the anatomy of the nervous system.

### *The Three Systems within the Nervous System*

THE NERVOUS SYSTEM as a whole has three distinct but coöperating parts: the central, the peripheral, and the autonomic nervous systems. The central nervous system is made up of the brain and spinal cord. Its function is to correlate and integrate—to make the various parts of the body work together as a good team should. The peripheral nervous system consists of nerve fibers passing from the receptors to the central nervous system and of fibers passing from the central nervous system to muscles and glands. The autonomic nervous system, which controls the unconscious action of our organs of maintenance, will be described later (pp. 719–722). Figure 76 will give you a general idea of these structures.

### *Neurons and Nerve Pathways*

THE NERVOUS SYSTEM is the connecting link between the stimulus and the response. In previous chapters we have devoted most of our attention to the description of stimulus situations necessary for the prediction of a particular response. We have talked about experiences which change the organization of behavior, but we have not gone into the details of how such changes are effected through reorganization within the nervous system itself.

### *The anatomy of the single neuron*

A neuron is a single cell, a nerve cell, and is not to be confused with a nerve, which is a bundle of nerve fibers. Like all other cells, neurons are made up of protoplasm surrounded by a thin living membrane, or wall. Every living cell has a *nucleus*, which can be seen under the microscope in a properly stained cell. In the neuron, as in other types of cells, the nucleus is necessary to the nutrition of the whole cell. Any part of a neuron which becomes separated from its nucleus will die and disintegrate or degenerate. Because degenerating fibers stain differently from normal ones, anatomists have been able to map the pathways of the nervous system by destroying the part of the neuron containing the nucleus and then, with the aid of a microscope, tracing the degenerating fiber wherever it goes throughout the nervous system. The degeneration stops at the end of the neuron, indicating the validity of considering the nerve cell as the structural unit of the nervous system.

In addition to a nucleus, all neurons have *dendrites* and *axons*. Dendrites are highly branched, usually quite short fibers at one end of the neuron which are the receiving mechanisms of the nerve cell, taking in impulses from other neurons. Axons are fibers on the opposite side of the nucleus, terminating in end-brushes, by which they transmit an impulse to the neuron next in line or direct to the muscle or gland. Certain axons in adults are several feet long, for example those passing from the lower end of the spinal cord to the tip of the toe. Some axons branch off, providing duplicate pathways. These branches are called *collaterals*.

The axons and collaterals of most neurons are surrounded by a fatty white covering known as the *myelin sheath*, which in some way not yet entirely understood seems to be essential to the functioning of the neuron. Nerve fibers which are destined to become myelinated do not function until their myelin sheath is formed.

Neurons vary widely in size and shape, depending upon the function they perform and the length of the distances they run. Some of the more important types are shown in Figure 77. On the basis of function neurons are divided into two classes: *long-conducting neurons* having single, long axons, and *correlating*

*fibers* having short axons, but many of them, to provide many cross-connections or alternate pathways. The central nervous system contains both types; the peripheral system has only long conductors. All of the sensory and motor fibers are of this type.

### *The physiology of the single nerve cell*

Physiologists have discovered a great many facts concerning the functioning of nerve cells which have significance for psychology.

*The nature of the nerve current, or nerve impulse.* The nerve impulse may be likened to the chain of fire which sweeps along the fuse of a firecracker. Like the fire traveling along a fuse the nerve impulse requires very little energy to start it but releases a great deal of energy in the muscles and glands. The nerve impulse passes very rapidly. In some nerve fibers the speed of the nerve impulse is about 100 yards a second—about ten times as fast as a good sprinter. The nerve impulse is alike in all sorts of nerves, except for differences in magnitude and speed. Different impulses produce different effects only because they pass over particular neurons whose connections are different, not because the impulses are themselves different.

The nerve impulse is not conducted in the same way that a wire conducts electricity. Electrical current is conducted passively like sound waves or ripples in a pool of water. If an obstruction is met, the wave passes on but is reduced in size. That the situation in the nerve fiber is quite different is shown by the following experiment. If the intensity of the impulse at one point in a nerve fiber is weakened by treating the tissue with some drug such as alcohol fumes, the original strength will be regained as soon as the impulse reaches an untreated, normal stretch of nerve. In this way the nerve current resembles the firecracker fuse or the chain of gunpowder which has been dampened at one point. The reason is the same in both cases—the size of the nerve impulse or the fire in the fuse depends not on the energy of the original stimulus but on the energy available in each section of the nerve fiber or fuse.

Although the nerve impulse is not a simple electric current, its passage along a fiber gives rise to electric currents. In fact, the physiologists now rely heavily upon the measurement of these



gunpowder, will restore itself in the small fraction of a second after it has discharged. This restoration is automatic.

*Nerve cells respond "all-or-nothing."* The intensity of the impulse in a neuron is independent of the intensity of the exciting stimulus once the threshold value has been attained. Thus, as has already been suggested, the strength of the response of each individual neuron depends on the *condition* of that neuron (its available energy), not on strength of stimulus; if it responds at all, a neuron responds with all its available energy. This is fuller evidence that nerves conduct actively and not passively.

This statement must be elaborated, however, since we all know from general experience that the strength of the *sensation* does vary with the strength of the stimulus when other things are constant. Careful laboratory research has shown that fairly definite mathematical laws can be written to describe this relationship, but lack of space forbids us to enter very far into so intricate a field of human knowledge. We must be content with the generalization that intensity of sensation mounts as intensity of the stimulus increases. What is the neural mechanism underlying this undisputed fact? How can the apparent discrepancy be explained?

It is true that individual nerve fibers respond in an all-or-nothing fashion. We cannot, therefore, explain the greater effect of a stronger stimulus as a larger discharge of each of the nerve fibers involved. Studies on the physiology of nerve fibers tell us that the length of the refractory phase of a fiber is relative to the strength of the stimulus. The stronger the stimulus, the more often will each fiber send in an impulse. In this fact we have part of the story but not the whole thing. We can logically suppose also that fibers differ in their thresholds of reaction. A faint stimulus applied to a certain sensitive region will be sufficient to excite some of the sensory fibers having their origin in that area; a stronger stimulus will excite *more* fibers than will the weaker stimulus and will, of course, cause those which are excited at a lower level to discharge at a greater rate than they did before. Thus the story is read in terms of the numbers of fibers contributing and the rate at which they contribute.

The most widely accepted theory of the nerve impulse is known as the membrane theory and places emphasis on the chemical ac-

tivity in the nerve fiber. According to this theory the electrical phenomena are regarded as mere indicators of chemical reactions within the nerve fiber; the resting nerve fiber might be likened to a wiener filled with ions carrying negative charges. The membrane of the fiber is surrounded on the outside by positively charged ions. When the nerve fiber is activated, a chemical action starts which destroys the polarization of the membrane by opening up the pores in it, thus allowing the positive and negative charges to have contact and neutralize each other. Once the membrane is permeable, positive ions farther along move in to neutralize negative ions, which in turn render this new area permeable. Thus the nerve impulse "rolls" down the nerve fiber in the direction indicated by the straight area in Figure 78a. The membrane in the area through which an impulse has recently passed remains open or permeable for some time, thus preventing the building up of positive charges on the outside of the membrane and negative charges on the inside. This is during the absolute refractory period when, as you have seen, the nerve fiber cannot be stimulated no matter what the strength of the stimulus. As the nerve fiber loses its permeability, positive charges commence to build up on the outside even as negative charges build up on the inside. This is the relative refractory period during which an unusually strong stimulus can activate the nerve fiber. As soon as these charges have built up to their normal resting level, the fiber again becomes normally excitable.

### *The structure of the sensory-motor arc*

In its simplest form the sensory-motor arc is made up of two neurons. One of them possesses at one end endings sensitive to stimulation from the outer world (or connects with a receptor cell). This cell is called a sensory neuron, or *afferent* fiber, because it carries the nerve message *toward* the center. The other neuron connects with the first and terminates in some organ of response. This second cell is called the motor or *efferent* fiber, because it leads the nerve message *away* from the center or point of connection.

In most cases there are several connecting cells which serve to correlate the functioning of the various parts of the nervous system. Connections are provided to make possible the *divergence*

vital functions of nutrition; others are involved in walking, etc.

*Localization.* To elicit a reflex response of any given part of the body, the stimulus must be applied to a fairly well circumscribed area of the body. Many of the simple protective reflexes involve action at the same part of the body as that which is stimulated. For example, when the leg is pinched, it is that leg which is withdrawn. In the struggle for existence those individuals survived who were equipped with specific reflexes adequate to protect the body from injury.

*Reaction time.* Even the simplest reflexes require some time. The delay between the presentation of the stimulus and the execution of the response is made up of the time required for muscles to contract, for nerves to conduct, for the sensory nerve ending to be aroused, plus time lost at the synapse. The more synapses involved in a stimulus response act, the greater the reaction time of that act. But reflex actions as a whole are very quick, much quicker than voluntary actions. In fact, protective reflexes are frequently performed so quickly that the adaptive withdrawal is complete before one becomes aware of the stimulus and its danger.

*Irradiation.* We have already seen that as the strength of the initial stimulus is increased, the number of muscle fibers coming into play is increased. The area in which fibers respond is also widened. Lightly scratch the sole of a baby's foot, and the toes alone will move; pinch the foot, and the whole leg will be sharply retracted; a stronger pinch may produce a response of the entire body. As more sensory fibers are activated, more correlation neurons come into play, leading to stimulation of more motor fibers.

*Facilitation.* Certain stimulus-response acts serve to reinforce each other. When the tendon just below the knee-cap is struck, the loosely hanging leg will jerk upward. If the subject is asked to clench his fist just before the knee-cap tendon is struck, the amplitude of the knee jerk will be increased.

*Summation.* If a *subliminal* stimulus (one whose intensity is below the threshold of response) is repeated at a definite rate, the reflex response will eventually take place even though a single presentation of even a somewhat stronger stimulus might fail to be effective.

*Inhibition and reciprocal innervation.* As we have seen, there are

many afferent neurons converging through correlation neurons on a single motor neuron. The numerous afferent impulses compete for the "final common path" or motor neuron. Some arrangement must be made to give a certain impulse "the floor" by inhibiting the others clamoring for recognition. Without this, behavior could never be smooth and effective.

Muscles are arranged in antagonistic pairs, one extending and one flexing a given joint. When one muscle contracts, its antagonist relaxes. The contracting of one muscle is accompanied by the inhibition of response in the antagonist. This is known as Sherrington's law of reciprocal innervation. The best example of inhibition is found when we stimulate the sole of the foot with a painful stimulus and at the same time with pressure. Painful stimulation alone will cause the leg to withdraw in protection; pressure will elicit the so-called "extensor thrust" or pushing out movement of the foot used in walking or in catching one's balance. If the two stimuli are presented simultaneously, the withdrawal reflex alone is elicited. The thrust response is inhibited with the result that it does not impede the withdrawal. Thus, effective reactions inhibit or block other competing reactions which would employ the same final common path. Wendt has recently extended this principle to cover conditioned, or learned, responses, showing that inhibition is never passive.<sup>1</sup> That is to say, when a response is lost, it is because some other movement takes its place.

How is this selection accomplished in the nervous system? There are three characteristics of the stimulus which give advantage in the competition for the final common path. Painful stimuli have the right of way. The organism is innately organized to permit the important business of self-protection to come first. Strong stimuli or weak stimuli repeated have the right of way. Too frequent repetition of a response will give the right of way to the rival response through fatigue and adaptation.

### *Many duplicate pathways are provided in the nervous system*

Hundreds of nerve fibers are involved in the simplest stimulus-response act. Each sensory-motor arc is duplicated many times. Frequently the duplicate connections lie side by side, but there are numerous instances in which the duplicates take quite a

different course from the receptors of the sense organs to the effectors. This great duplication is of considerable advantage biologically, since the danger of loss of function resulting from injury to one part of the body is greatly reduced.

The brain is especially rich in duplications. Experiments which will be described presently show that injuries to certain parts of the brain need not bring permanent disability, for other areas are capable of taking over the lost function. This fact makes possible the re-education of individuals who have become paralyzed or insensitive through the impairment of a particular portion of the brain.

### *The Neurological Basis of Learning*

WHAT HAPPENS in the nervous system when we learn to play tennis or recite a poem? Following learning we know that our behavior is changed; what is the physiological basis of this change?

The whole problem of how the neural elements become organized in learning is one of conjecture. We shall not dignify these hunches by calling them hypotheses, for they have suggested few crucial experiments.

#### *Some theories of how learning takes place*

Lashley has presented an excellent review of the more common conceptions of the neural basis of learning.<sup>2</sup> We shall draw heavily from his article.

1. *Growth of new processes connecting the neurons.* The neurologist, Kappers, suggests that connections are formed by the growth of axons and dendrites under the influence of bio-electric currents set up when nerve cells are active. Such a process would be far too slow to account for the speed with which certain associations are formed. It may be that this theory explains some part of learning, perhaps the slow maturation of pathways necessary to learning, but it is not adequate in and of itself.

2. *Increase in the amount of the conducting substance through exercise.* Theories of this type have been inspired by the observations that muscle fibers grow larger through use and that the

nerve cells of the visual cortex degenerate in blind animals. Such theories suffer the limitation that they imply that learning is simply a matter of increasing the capacity of a pre-existing connection between stimulus and response. They do not explain how stimulus-response connections are made for the first time as in the formation of a conditioned response, and they do not account for the rapidity of learning.

3. *Chemical changes at the synapse.* Theories of this sort have had a wide vogue. They all argue that learning takes place through an alteration of the relative resistances of synapses. The diagram shown in Figure 79 will make the theory clear as it is used to explain the neural basis of simple conditioning. In this diagram SN-1 is a sensory neuron connected by CN-1, a correlation neuron, to MN-1, a motor neuron, which in turn connects with a muscle, M-1. SN-1 also connects through CN-3 with MN-2 which leads to M-2. Another sensory neuron, SN-2, is connected with MN-1 and with MN-2 by means of the correlation neurons CN-4 and CN-2. Suppose that the path between SN-1 and MN-1 offers less resistance than the path between SN-1 and MN-2. In this case a stimulus applied to SN-1 will produce the response R-1. The more frequently this path is exercised, it is argued, the lower the resistance will become and the more easily will the stimulus, St-1, effect the response, R-1. If the connection between SN-1 and MN-1 is present in the absence of opportunity to learn, the response is of the innate sort. The next step is to explain conditioning.

Suppose that SN-2 is stimulated before or at the same time as SN-1. Activity in the chain SN-1, CN-1, MN-1 would reduce the resistance at the synapse Sy-1 by making the dendrites of MN-1 more permeable and would permit an impulse to travel along the chain SN-2, CN-4, MN-1 more easily than it could pass from SN-2 through CN-2 to M-2. If this were repeated often enough, a point would finally be reached when the resistance of this former chain would become so low that St-2 alone would produce a response of M-1. This theory suffers mainly from lack of experimental verification.

A more naïve view of the neural basis of learning holds that when two reflex chains are stimulated simultaneously the dominant final path "drains" off the neural energy stored in the neu-

rons of the other path thus forcing the connections open and strengthening the originally weaker path until it is completely functional. Such a theory accounts for the fact of conditioning but is contrary to many of the known facts of nerve physiology. Nerve energy is not a fluid which can be drained; neurons are not pipes. Neurons are fuses capable of recharging themselves after they have "burned."

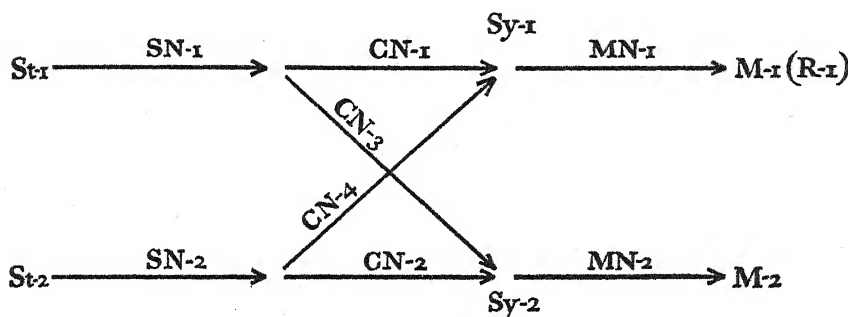


FIGURE 79. Diagram illustrating the synaptic theory of learning.

4. *Persistence of the excitatory disturbance.* Other theories account for the persistence of the effects of exercise of a neural connection by a persistence of the first excitation. They too, however, fail to account for the formation of new connections and suffer from the further argument that, whereas memories will persist for years, the evidence is that a nerve cell soon returns to normal after the impulse passes.

#### *An examination of the synaptic resistance theory of learning*

The synaptic theory is the most widely accepted one of the four types outlined above. Let us see how well it accounts for the known facts of learning.

*Does the synaptic theory of learning fit with the facts of drive?* In Chapter 9 we learned that motivation plays a large part in learning. Does the synaptic theory of learning square with these facts?

A. The synaptic theory of learning and the principle of satisfaction. According to the principle of satisfaction, as you will recall, learning takes place when a particular response to a certain stimulus leads to satisfaction of the drive. In relating this to the

synaptic theory of learning, we are forced to think of each functional stimulus as being twofold. There is the external stimulus and the internal or drive stimulus. Before learning has occurred, the drive stimulus is effective in bringing about a whole series of responses. In terms of the synaptic theory, it would serve to lower resistance of *all* of the paths. Drive stimuli would never produce learning if all of the responses they elicited led to satisfaction of the drive. This is not the case. One of the responses leads to satisfaction; the others do not. The successful response is repeated most often, since it is the terminal reaction and hence has the advantage of frequency and recency. Our problem thus boils down to the explanation of frequency and recency.

b. The principle of motivational intensity. The stronger the drive, the less frequently will the organism react to any stimulus other than the drive stimulus and the external stimulus associated with it. By consequence, the greater will be the probability of the events described above.

c. The factor of punishment. We have seen (Chapter 9) that this is but a special case of (A.) and requires no further treatment.

d. The factor of immediacy. The longer the individual delays between the presentation of a stimulus and the making of a particular response, the greater the probability that some other stimulus-response activity will occur during the interval of delay, serving to set up conditioning in some other direction.

e. The principle of symbolic reward and drive. When symbols have acquired the value of drives and satisfactions, they follow the same laws as govern the primary drive and satisfaction and require no special explanation.

*Does the synaptic theory of learning fit with the facts of exercise?* As we saw in Chapter 9, the more often a response is repeated the greater the tendency for it to take place. How does the synaptic theory of learning fit with this phenomenon?

a. Does the synaptic theory of learning explain the effectiveness of frequency? This problem presents no particular difficulty. The synaptic theory holds that the more frequently a neural connection is exercised, the lower its synaptic resistance becomes. The behavior correlation of this is that the more frequently a stimulus response act is performed, the greater the likelihood that the same



stimulus will in the future elicit the same response, granting, of course, that the same drive exists.

B. The synaptic theory and the law of recency. The synaptic theory holds that the lowered resistance of a connection will be lost in time if not exercised again. Add to this the further fact that in a long delay between two exercisings of the same connection there is a greater probability that the stimulus in question will be connected to some new response, and we see that the synaptic theory will take care of the law of recency.

There is nothing in the above discussion which shows that the synaptic theory is correct; nothing to disprove it. It would appear that the synaptic theory of learning will fit in with the explanation of any phenomena included in the principles of learning.

The fate of the synaptic resistance theory of learning will have to be settled by the physiologists. For the time being, we must consider it as good as any other. Our evidence is not crucial. The synaptic resistance theory, though not demonstrably inconsistent with the facts of learning, is, nevertheless, a poor theory because it does not suggest crucial experiments and enable us to predict their outcome. Unless the physiologists do something about it, this theory will have a long life, for it will probably never be proved or disproved on the basis of psychological analysis.



The nervous system is the most important coördinator of bodily activities. It is made up of three parts: the central, the peripheral, and the autonomic. The peripheral nervous system is made up of the nerve fibers passing from the receptors to the brain or spinal cord to muscles and glands. The central nervous system includes the brain and spinal cord and serves to coördinate and redistribute impulses traveling in the peripheral nervous system. The autonomic nervous system is closely connected with the central nervous system and has as its specialized function the control of automatic bodily functions such as digestion, heart beat, etc. The structural unit of the nervous system is the neuron which is a cell specialized for irritability and conduction. The functional unit of the nervous system is the reflex arc which connects a receptor with an effector. The nervous system provides many duplicate pathways. It pro-

vides a means for the formation of new connections between receptors and effectors. A nerve cell is more like a train of gun powder than it is like an electric wire, in the sense that the nerve cell conducts actively. The nerve cell differs from the train of gun powder in that the nerve cell is capable of recharging itself. Nerve cells respond all-or-nothing, that is, the intensity of the activity in the neuron is independent of the intensity of the exciting stimulus which sets off the reaction. The functional unit of the nervous system is the sensory motor arc or the chain of functional parts which connect the receptor with the effector. The simplest instances of sensory motor arcs are reflexes, which are quick, useful, and automatic. Although learning must be accompanied by systematic changes in the nervous system, no one knows what these changes are, and as yet no satisfactory theory has been evolved.

### *Recommended Readings*

ADRIAN, E. D. *The Basis of Sensation*. Norton, 1928.

A stimulating presentation of the events in the nervous system which underlie our sensory experiences.

CARLSON, A. J., and JOHNSON, VICTOR. *The Machinery of the Body*. University of Chicago Press, 1937.

Chapters 2 and 9 discuss the function of cells in general and of muscle and nerve cells in particular, in an authoritative but comprehensible way.

FULTON, J. F. *Physiology of the Nervous System*. Oxford University Press, 1938.

A scholarly treatment of the experimental work on the physiology of the nervous system for the serious student with a good background in biology.

ent kinds of behavior and by correlating the areas of greatest activity with the nature of the stimulus-response behavior going on at a given moment, we can make considerable progress in determining which areas are involved in various types of behavior. You have already been introduced to this method in connection with the study of tiny muscle movements in the thinking process. (See pp. 391-392.)

### *The method of stimulation*

The method of stimulation has been used with great success. Some part of the brain is stimulated, usually with a weak electric current. The experimenter then observes what response takes place. He changes the point of application of the stimulus and notices how the behavior changes. In this manner it has been possible to map the so-called motor areas of the brain.

### *The use of drugs of specific action*

When certain drugs are injected into the blood stream or painted on the brain tissue directly, the effect is the exaggeration or destruction of certain types of response. The points of application of the drug can then be correlated with the changes in behavior which are observed, and the function of the various parts can be inferred.

## *Localization of Function in the New-Brain* *(Cerebrum)*

THINKING BACK over the material given in Chapter 7, you will readily see that every sensory experience can be classified according to two fundamental dimensions—kind and intensity. Our visual sensations differ from one another in hue; our cutaneous sensations are labeled warm, cold, pressure, or pain; our auditory sensations are variable in pitch; our taste sensations are salt, sweet, bitter, or sour; our olfactory sensations appear to have six elementary qualities. Any sensation can differ in intensity from another of the same kind. What are the neural correlates of these conscious experiences? This field is still rich in opportunity for new knowledge despite a century of productive labor in it. Much is known; more remains to be learned.

One hundred years ago Johannes Mueller gave us the doctrine of "specific nerve energies." According to this doctrine a sensory nerve will produce a certain type of experience no matter how it is stimulated. Close your eyes and press upon the lids. In a moment you will see a wealth of color and design, yet the stimulus is not light but pressure. When the cut ends of nerves are stretched on the healing stump of an amputated leg, the patient sometimes reports sensations of pain, pressure, or itch in the toes that are no longer a part of his body. Strike a person on the back of the head, and he will literally "see stars." The sensation produced has been appropriate to the nerve cells brought into action and not to the stimulus itself. The *kind* of sensation we experience seems to depend upon the kind of *nerve cell* involved. One hundred years of physiological research have added little to this notion of specific nerve energies. True, certain qualities seem to be primary and others, secondary in the sense that the latter can be produced by combinations of the former. Hecht's experiment on the central mixing of red and green to give yellow is an example (p. 706).

### *Motor and sensory areas*

One of the oldest problems of neurology and psychology is whether or not there is localization of function in the brain. For a long time a controversy raged between one group of workers who held that each part of the cerebrum had a definite function which it alone could perform and others who held that the parts were more or less interchangeable functionally. As is so often the case, a compromise position is the most tenable one. For particular motor and sensory functions, special areas in the brain have been located. (See Figure 80, p. 699.)

*The motor area.* The cortex immediately in front of the fissure of Rolando has to do with motor functions. When this area is stimulated, some voluntary muscle group responds. It will be remembered that long motor neurons lead down from this area through the spinal cord to the motor neurons which supply the muscles of the body and of the extremities. When areas in this region are destroyed, movement is impaired in some part of the body. The paralysis following a "stroke" is due to interruption of these fibers.

The feet are represented at the upper part of the area, the trunk farther down, and still farther down the hands; the face and tongue are localized at the very bottom.

*The somesthetic area.* Just back of the fissure of Rolando is the *somesthetic* or body sensitivity area. When this area is destroyed, the human individual suffers some important losses of sensory ability. Such a person cannot tell where an object is touching him. He will be aware merely of an unlocalized pressure. He is able to note the difference between stimuli which are very hot and very cold, and he retains the sense of pain, but he cannot distinguish warm and cool objects. With his eyes closed, he cannot tell what position his arms or legs are in or how they are being moved by the neurologist. When the somesthetic area of one side of the brain is destroyed, the subject reports that the opposite side of his body does not feel natural. When the skin is touched, he must look to see where it is. He has lost the ability to localize. He is able to handle objects, for he retains the power of movement, but he cannot tell you whether it is a key or a match that he is handling unless he looks at it. He cannot tell sandpaper from silk, although he will report that one is pleasant and the other unpleasant.

If only one side of the area is destroyed, his sensory ability is lost only on the opposite side of the body. If only a part of the somesthetic area is destroyed, the impairment is limited to a part of the body. In general the localization of specific functions within the somesthetic area corresponds to that of the motor area.

Even when the cerebral cortex is entirely destroyed, not all body sensitivity is lost. Lower centers, especially the thalamus or old-brain, also play a part in such sensitivity. In lower animals, having a small cerebral cortex, this old part of the brain is responsible for nearly all sensation. Although in man most of the sensory function has been taken over by the cerebral cortex, pain and a diffuse, poorly localized sense of pleasure or discomfort are still carried out by the old-brain, under the regulation of the cortex.

The sensations experienced through the activity of the thalamic centers are fairly strong but vague and diffuse. Without the help of the cerebral cortex, localization of stimuli and perception of space through the body sensations are not possible.

T. C. Ruch has studied the localization of bodily sensitivity in

monkeys and chimpanzees by means of the cortical extirpation technique. First his animals were trained to discriminate small differences in the magnitude of lifted weights.<sup>1</sup> After the animals were well trained, various lesions of the cerebral cortex were produced surgically. Post-operative tests showed that lesions to the motor area, the somesthetic area, and to other parts of the parietal lobes produced no great or permanent decline in the ability to make the discriminations. With the whole of the parietal lobe destroyed, the performance of the animals was very poor but not completely abolished. Ruch suggests that wide areas of the cerebral cortex, including a part of the frontal lobe, cooperate in the performance of this function; the thalamus, too, seems to play a part. Corresponding lesions of the brain of man were shown to produce greater impairment of discrimination.<sup>2</sup> The monkey is less dependent upon its cerebrum than is man.

*The visual area.* More is known about the visual area of the brain than about the other sensory areas. As we have seen in Figure 80, this area lies directly at the back of the brain. Just as the various parts of the skin of the body are projected upon the somesthetic area of the cortex by means of neural connections, so is each receptor cell of the retina of the eye similarly represented by cells in the cortex of the occipital lobe. A huge bundle of nerve fibers constituting the optic nerve leads back from each retina, forming a cross at a point well back from the eyes themselves and located at the base of the brain. Half of the fibers from the left eye then go to the right side of the cerebrum, and half from the right eye go to the left side of the brain, the others from each eye going on to the brain on the same side.

The point of crossing is called the optic chiasma. If we cut the optic nerve (between the eye and the point of crossing), the individual would be blind in that one eye. But suppose that we cut the *optic tract* (between the chiasma and the brain itself); the person would suffer from a peculiar sort of blindness. Such destruction would affect the ability of both eyes to function but would affect each in part only. He would be blind in the left half of each retina if the tract were cut on the left side or in the right halves of his two retinas if the right optic tract were cut. This type of blindness would be noticed with both eyes open or

with either one open alone. It must be remembered that when a person is blind in one-half of the retina he cannot see objects on the opposite side of the visual field, since the lens of the eye reverses objects from left to right.

The situation just described may be better understood by studying Figure 81. When some fraction of the tract or of the visual

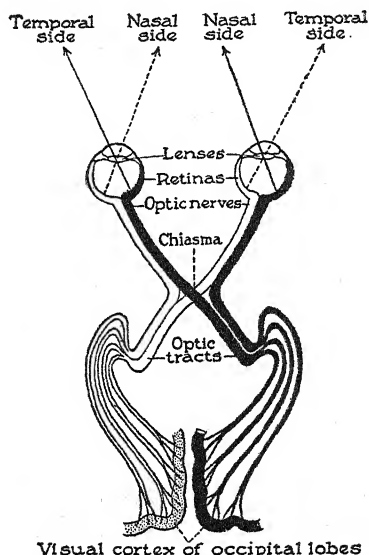


FIGURE 81. *The nerve pathways from the eyes to the cortex.*

cortex on one side is destroyed, there results a blindness in the corresponding parts of the two retinas which is less extensive in area than that brought on by complete destruction. All this is further evidence that when we are looking at anything, there is, within the visual area, a fairly close point-to-point correspondence with the retina and hence with the external visual world.

It may also be readily predicted from Figure 81 what happens when the optic chiasma is cut through from front to back. This operation results in a still different type of visual impairment. In this case the left half of the left retina and the right half of the right one are all that can still get messages through.

Beyond the facts just presented, little is known of the brain mechanisms in seeing. How the brain represents depth and hue is still a mystery. There is no space in an elementary book of this

sort to discuss the conflicting and unproved theories in this field. We shall make one exception.

Although certain theories of the mechanism of color vision hold that color mixing is a retinal phenomenon, there is one type of experiment which several psychologists have performed and which indicates that such fusion can also be accomplished in the cortex. Hecht arranged an apparatus whereby light of one hue could be shone on one retina while light of another hue illuminated the other retina.<sup>3</sup> There was no possible crisscrossing of light. If the two hues yellow and blue are used, the subject sees white light; if red and green lights are used, the subject sees yellow light. This is exactly what happens in the color-mixing experiment in which the mixed lights shine on both retinas at a time. Hecht's results show that color mixing *can* take place at some point in the nervous mechanism beyond the retinas, although they do not disprove that mixing also takes place in the retinas.

When the visual tract is severed before it has gone very far into the brain, blindness is accompanied by loss of visual reflexes to light. The iris will not close when light is flashed in the eye. If the optic tract is cut further back, however, or if the visual cortex itself is destroyed, reflex contractions of the pupil to light still take place. The explanation is that the nerve fibers in the optic nerve which give rise to this reflex end at some point back of the optic chiasma, passing their impulses on to other neurons.

Clinical studies reveal an important difference between the organization and functions of the somesthetic and the visual areas of the cortex. Destruction of the visual cortex in man is followed by blindness which is complete, but similar destruction of the somesthetic area, as we have seen, merely destroys ability to differentiate finely between stimuli. This difference is explained on the basis of progressive *encephalization* (progressive dominance of the brain over the activities of the rest of the nervous system) as we ascend the evolutionary series. As we pass from the lower to the higher animals, we find that the cortex assumes more and more importance. This encephalization of function is most noticeable in the case of vision. The somesthetic functions have undergone considerably less.<sup>4</sup> Many other evidences of it will be encountered in the forthcoming pages.



*The auditory area.* From the receptor cells for hearing, located in the inner ear, nerve fibers lead into the brain to relay stations through which reflexes to sounds are made possible. From connections in these relay stations other neurons continue upward to the auditory area of the cortex located in the wall of the fissure of Sylvius that belongs to the temporal lobe. As in the case of vision, approximately as many fibers go to the cortical area on the same side of the brain as to that on the opposite side. Clinical accounts show that the destruction of the cortical auditory area on one side reduces hearing ability but does not cause complete deafness. There are many theories to account for the manner in which the brain functions in producing the conscious qualities of auditory sensation—pitch, intensity, and timbre, but so far actual knowledge is very scanty.

*The gustatory and olfactory areas.* Nerve fibers come from the olfactory patches of the nostrils to connect eventually with a part of the cerebral cortex known as the *hippocampus*, which is located directly beneath the temporal lobe. Fibers from the olfactory patches lead to the old-brain area where they set up connections making possible reflex movements to smell stimuli. The centers for taste are usually said to be in a region close to the olfactory area, but recent developments suggest that taste is a highly developed touch sensation and is localized near the somesthetic area.<sup>5</sup>

### *The association centers*

Attempts to localize the more complex mental processes were carried out at first by physiologists, without the help of psychologists. By the beginning of the twentieth century, however, the psychologists were starting to do their part. The rapid advances now being made are a happy testimonial to the value of coöperative research.

We will find, if we draw a map of the cerebral cortex and mark off the areas we now know to be essential to motor and sensory functions, that there are large portions which are not touched by our pencil. These parts are not unused, however. They are the *association areas*. The association areas of each side of the cerebrum are richly connected to each other, to motor and sensory areas, and to similar areas on the opposite side. They serve to

correlate and integrate the simpler sensory and motor functions. In fact, the sensory areas are the gateway into the cortex, and the motor area is the exit, the real work of the brain being done by the association areas. For example, injuries of the cortex just outside of the visual area, not causing blindness, destroy awareness of depth, recognition of visual objects.

Much is known of the relationship between damage to association areas and defects in speech and understanding of words, but there is still much to be learned before speculation is eliminated and clear understanding triumphs over theories which are at times discordant.

*Speech areas.* In 1861 Broca reported the case of a patient who showed an almost complete loss of speech ability. Careful examination of the patient's brain showed that an area in the frontal lobe of the left cerebral hemisphere just above the fissure of Sylvius and extending to it was destroyed. This area has come to be known as *Broca's area*.

About ten years later Wernicke discovered that destruction of the cortex of the left temporal lobe below the auditory area, extending backward and curving up around the end of the fissure of Sylvius in the form of a J, was associated with inability to understand spoken language. Subsequent investigations have upheld the validity of these early observations and have extended their significance by showing that similar phenomena occur when other association areas are destroyed. For example, as we have seen elsewhere, aged people lose their ability to learn new facts, to see new relationships, to solve new problems. These behavioral losses have been found to be correlated with degenerative changes in the cells of the cortical association areas.

These first observations on the association areas laid the foundation for many detailed researches from which numerous important conclusions have been drawn. In a general way the association centers have been found to be the parts which are essential to learning and to the use of symbols to represent absent objects and events in thought and speech.

*The work of Franz and Lashley.* A new approach to the problem of locating the higher centers, utilizing the extirpation method, was followed by Franz and by Lashley. Their methods consisted

in training animals to perform certain tasks, such as opening a puzzle box or running a maze. They used monkeys and other animals as subjects in these experiments. After the habit was well learned, portions of the brain would be surgically removed and the animals retested to see how much the habit had been impaired. Such experiments showed that in the case of some but not all habits the removal of certain parts of the cortex will abolish the habit but that it can be relearned. If the habits had been permanently abolished, i.e., if relearning had not taken place, we would have been forced to conclude that localization of such functions is hard and fast. Such, however, was not the case.

Loss of cortical tissue did slow up the original learning of a maze habit by the rat, but the loss in learning ability seemed to be dependent upon the *amount* but not the location of the cortical tissue removed.<sup>6</sup> It is not hard to find a probable explanation for this. Ordinarily many sensory cues are available to guide the rat through the maze—more, indeed, than the rat needs. Removal of a part of the brain may destroy certain sensory elements but will leave others.

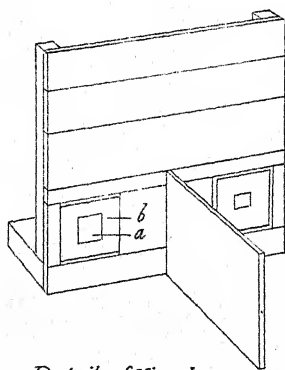
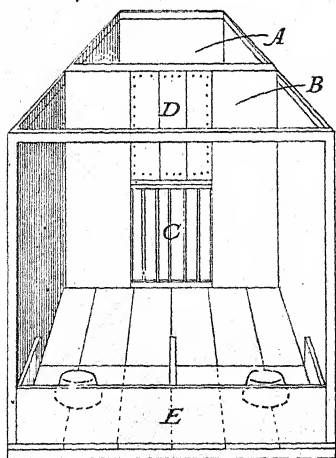
The first work with rats has been followed by many recent studies of great importance on other higher forms. Culler has shown that a dog from which the entire cerebrum has been removed—a very difficult operation—shows some signs of becoming conditioned to an auditory stimulus but the behavior never becomes specific and neat as occurs with the normal dogs.<sup>7</sup> The response used was the lifting of the foot at the sounding of a tone to avoid an electric shock on the paw. The dog, after many trials, showed a sluggish and generalized reaction to the tone, involving the whole body as well as the foot receiving the shock.

Jacobsen has contributed a number of interesting experiments on the effect of destruction of the most forward part of the frontal lobes, a purely association area.<sup>8</sup> Making lesions of varying size and location within the frontal lobes, he analyzed the effects of such lesions on two types of behavior situations: (*a*) situations in which the essential cues were present in the animal's environment at the time of the response (problem boxes, discrimination habits, etc.); and (*b*) situations in which certain essential cues had to be *recalled* from recent experience (delayed responses).

A short description of the apparatus used by Jacobsen will make clear the nature of the two types of behavior situation covered in his experiments. Figure 82 shows the apparatus.

In the first type of problem situation the food was obtained by solving a simple puzzle, such as turning a crank through an arc of 270 degrees in a clockwise direction, pulling a rope projecting from the box, or performing some more complicated series of movements to release a latch, making it possible to get into a box containing food. In the visual discrimination experiments the food was found behind a stimulus card which differed in brightness from another stimulus card behind which there was no food. The monkeys eventually learn to go to the proper stimulus card without touching the incorrect one. The correct card is placed to the left or to the right in random order so that the animal must react to the brightness of the card in making the correct choice. Notice that in the problem boxes and in the discrimination tests the sensory cues are always present. Symbols are not necessarily involved.

- A Delay Compartment*
- B Reaction Compartment*
- C Portcullis Grille*
- D Portcullis Door*
- E Tray and Cups*



*Details of Visual Discriminating Apparatus*

- a Stimulus Card*
- b Limiting Flange*
- c Carrier and Holder*
- d for Card*
- e Track for Carrier*
- f Locking Device*
- g Food Tray*

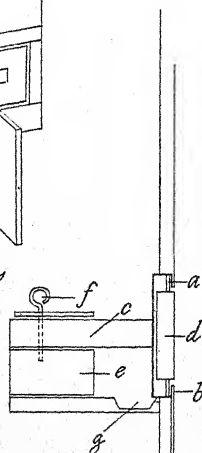


FIGURE 82. Jacobsen's apparatus for study of association areas.

In the delayed response experiments the monkey is placed in compartment A with door D raised so that response chamber E can be seen through the grill C. The monkey's attention is attracted by the experimenter, who places a piece of food under one of the inverted cups shown in compartment E. The door D is then lowered for a period of time, after which the door and the grill are raised so that the animal can walk into the forward compartment and get the hidden bit of food. The object of the experiment is to see how long the animal can delay with the food out of sight and still go directly to the correct cup. The cup employed is changed from side to side in random order. The important psychological feature of this situation is that the animal must react partly on the basis of memory. He sees the food put under one of the cups, then the cups are shut out of sight for a period of time; finally he is permitted to go to the food if he can. Obviously the position of the food must be represented by some symbol during the period of delay and that symbol must function as a stimulus in guiding the final response after the period of delay has terminated.

Jacobsen's results are summarized in his own words as follows:

- "1. Unilateral lesions caused no impairment of performance on any tests.
- "2. Bilateral lesions of the frontal association areas, either partial or complete, resulted in different effects on the two types of tests.
  - "(a) Memory for simple problem-box habits and for visual discrimination habits was not impaired, nor was ability to learn new tasks of a similar nature reduced.
  - "(b) The ability to perform delayed response was abolished by complete lesions of the frontal areas. The subjects failed in this test with delays as short as one or two seconds.
  - "(c) Subtotal lesions caused a shortening of the time through which memory was effective but did not entirely abolish this ability.
- "3. The deficit associated with frontal lesions cannot be attributed merely to an extensive injury of the cortex, since lesions in other cortical areas (motor and premotor, postcentral, and the parietal and temporal lobes) produced slight, if any, changes; on the contrary, the peculiar importance of the frontal areas in mediating the behavior in question is indicated."

These results confirm for the monkeys the same sort of thing observed in the case of speech difficulties due to lesions in the

speech centers. The association areas are essential to the performance of behavior which involves the use of symbols.

*Agnosias in man.* Disease or injury to certain association areas will bring about an interesting condition in which the person is unable to recognize objects by their "feel." Some familiar thing such as a toothbrush, a bottle opener, or a cigar lighter can be handled indefinitely and still not be recognized. Patients who show this type of disorder are still capable of experiencing normal elementary sensations. Their difficulty is in grouping these elements into normal perceptions. Objects are *felt* but not *known*. Similar disorders of perception are found in other sensory fields. These disorders are called *agnosias* or "inabilities to know." The agnosias are divided on the basis of the nature of the function which is impaired. The following list defines the more frequently encountered ones.

*Astereognosis.* Loss of ability to recognize objects through the sense of touch (cutaneous and kinesthetic senses).

*Alexia.* Inability to recognize printed words. This is commonly called word-blindness.

*Sensory Aphasia.* Inability to recognize spoken words. This condition is sometimes called mental deafness, because it occurs in persons who can hear simple sounds.

Astereognosis, alexia, and sensory aphasia seem to be associated with lesions in the association regions close to sensory areas of the cortex. Similar impairments of the motor association areas will give rise to motor disturbances, to queer movements, or to the inability to perform movements. Some of the more common of these are listed.

*Agraphia and paraphasia.* Loss of the ability to write or the employing of the wrong word or some meaningless symbol.

*Motor Aphasia.* Loss of ability to use spoken language. The use of the wrong spoken word is called *paraphasia*. For example, an elderly lady says quite in a matter-of-fact tone: "I staved the stafflings gage."

*Amimia and paramimia.* The inability to use gestures, and the incorrect use of them, respectively.

At one time it was felt that impaired perceptual abilities were quite separate and distinct in their causes from the defects on the

motor side. Modern psychology thinks of perception as fusing the sensory and the motor into a continuous and inseparable act. This conception is supported by the more recent clinical observations which show that the motor and sensory disturbances cannot easily be differentiated on the basis of the location of the lesion in the brain.

The student must not forget that these conditions can be encountered in hysteria as well as in cases of organic lesion. Oftentimes the layman is not able to tell the hysterical case from the organic. Once the history and the cause of the condition are known, it can be spoken of more descriptively as *hysterical astereognosis* or as *organic aphasia*, etc.

*The underdeveloped human brain.* Bolton and others have observed that the cortical cells in the frontal lobes of mental defectives are underdeveloped as compared with those of the normal human being.<sup>9</sup> These observations are in line with the experimental work of Franz, Lashley, and Jacobsen. The ability to learn and to deal with absent objects symbolically represented is the essence of intelligence. As we have seen, these abilities are to a large extent localized in the association areas of the frontal lobes. Although there is an association area close to each sensory area in the cortex, the frontal lobes seem to be the central clearing house for the whole brain.

### *The Problem of Cerebral Dominance and Handedness*

AS YOU HAVE already seen, there is considerable crossing over of the sensory and motor fibers from one side of the body to the opposite side of the brain; thus we are not surprised to find that human beings who are mainly right-handed have larger left cerebral hemispheres. The left side of the brain (supplying the right side of the body) has a richer blood supply. There is much evidence to suggest that one side of the cerebrum is dominant over the other, either through heredity or through use. Which of these two alternatives is true is not altogether clear, but there is suggestive evidence that cerebral dominance is at least in part a mat-

ter of use. Regardless of how it arises, its lack seems to be a condition of great significance. In the normal, right-handed persons, the so-called mid-line functions (those located in the mid-line of the body) are apparently controlled by the left side of the brain. The location of the speech organs makes speech a good example of such a mid-line function.

On October 14, 1931, a right-handed woman came to the New Haven Hospital. She was unable to write her name completely, showed a pronounced defect of memory, and was totally blind to objects appearing on her right side. She had difficulty in reading printed matter held in the unimpaired field of vision and in recognizing pictures of familiar objects and scenes.

These symptoms suggested that something was amiss in the *left* half of her brain. A surgical operation was accordingly performed, and a large tumor was found on the left side (of the brain) at the very back of her brain in the posterior aspect of the occipital.<sup>10</sup>

The significant point for our discussion is that a *left-handed* young man who had to have his left frontal lobe removed because of a tumor located there *failed* to develop aphasia or speech disorder.<sup>11</sup> Had he been *right-handed*, he most certainly would have become aphasic as dozens of clinical cases have shown. Tumors in the left side of the cerebrum of right-handed people may produce speech defects; tumors in the right hemisphere will not. The motor speech centers of the *right-handed* are in the *left* frontal lobe. Apparently left-handedness goes with the dominance of the motor-speech centers in the right frontal lobe.

Another case of aphasia has an interesting bearing on this discussion.<sup>12</sup>

The patient was naturally right-handed and learned to write with the right hand. At the age of ten the right hand was amputated, and the patient relearned writing with the left hand. Several years later an injury to the right hemisphere produced motor and sensory aphasia. After surgical removal of a cyst, marked improvement in the symptoms was noted.

This case suggests that cerebral dominance is produced to a certain extent by usage.

There have been innumerable instances reported in which attempts to train the left-handed child to use his right hand have



been followed by disorders of speech. The interpretation is that changing the naturally left-handed child disturbs the (to him) normal dominance of the *right* cerebral cortex. In the transition stage from left- to right-handedness we would expect a period of rivalry if cerebral dominance is a matter of relative amount of use. This period of conflict or uncertain dominance would result in conflicting impulses from the two hemispheres reaching the speech organs at the same instant. The result of such a state of affairs would be the spasms and deadlocks which are typical of the stutterer. Travis has reported that stuttering can frequently be traced to attempts to make naturally left-handed children write with their right hands.<sup>13</sup> Moreover, a significant number of such cases have been improved or cured following a deliberate switching back to the left hand. In corresponding manner, there is evidence that forcing a right-handed person to use the left hand will produce stuttering. If cerebral dominance is determined by the native constitution of the individual, we could well expect that attempts to switch to the unnatural hand would lead to permanent conflict between the two cerebral hemispheres with consequent persistence of the stuttering. This whole matter is still somewhat unsettled, for the facts are not entirely consistent.

Certainly stuttering can be caused by conditions other than switching from one hand to the other. Emotional conflict is an important source of stuttering. It is possible that at least part of the effect of switching grows out of the emotional upset engendered by the nagging of the child by parents and teachers who are trying to "correct" his left-handedness.

### *What Goes On in the Brain during Thought?*

THERE ARE several lines of evidence concerning the activity of the brain in thinking which remain to be considered.

#### *The electrical phenomena of the thinking brain*

You have already noted that nervous tissue and muscle tissue alike have the characteristic of generating minute electric currents when active and that this fact has been put to good use in studying the functioning of the human brain during mental activity. In

recent years many physiologists and psychologists have been attracted to this very promising field. Let us review some of their outstanding discoveries.

Berger discovered that the human cortex gives out rhythmical waves of electric potentials which can be studied by means of amplifying devices connected with electrodes placed in the scalp over the cortex.<sup>14</sup>

Lindsley recorded the waves from the scalp over the visual area of 132 children ranging in age from a few weeks to sixteen years.<sup>15</sup> A certain pattern of electrical discharge is established at about three months of age, and once established, it is never lost. Its frequency increases rapidly during the first year, then more slowly until the adult level is reached at about 12 years of age. Amplitude increases during the first 2 years, dropping sharply during the third year and more slowly thereafter, to reach the adult level at about 15 years of age. The time at which the brain waves are first observed in infants corresponds closely with the appearance of the first evidences of visual perception. This coincidence in time suggests a functional relationship.

Travis and Knott applied the technique of brain current registration to the problem of stuttering.<sup>16</sup> Records of normal and stuttering subjects were taken during silence and during simple propositional speech. The electrodes were inserted in the scalp over the visual cortex of the brain. The normal subjects gave waves of a duration of one-tenth second while silent. During speaking the waves of the normal subjects were faster, each one lasting .09 seconds. The comparisons between the stutterers and the normal subjects showed such small differences that no definite conclusions are yet to be drawn from them.

In another experiment Travis had subjects sit in an apparatus for measuring brain waves under instructions to relax and "let their minds wander."<sup>17</sup> Without warning the experimenter would say "Now" and ask the subject what state of consciousness had been interrupted. By comparing the pattern of brain waves with the nature of the conscious state accompanying them, it was found that abstract thought and blankness went with large waves and that concrete experience, such as sensation and vivid imagery, was accompanied by small waves.

Davis and his co-workers have discovered characteristic changes in brain waves upon going to sleep.<sup>18</sup> In sleep the waves are larger and more regular than during waking.

Gibbs and his associates found that epileptic seizures were accompanied by characteristic brain-wave patterns.<sup>19</sup>

Perhaps more striking than any of the studies cited so far is that of Gottlob, who found identifiable differences in the brain-wave patterns of extroverts and introverts.<sup>20</sup>

Studies of this sort are promising, but we should not expect the time to arrive soon when we can hook up our apparatus to the scalp of the subject and read the complete story of his thinking—"read his mind."

*Voluntary and involuntary responses in the nervous system.* The modern psychologist thinks of will or *volition* as a descriptive category, not as some mysterious mental or moral force capable of exerting a controlling influence on our behavior. Responses which the individual can make or refrain from making at will are called voluntary responses. Muscles are of two types: (1) voluntary and (2) involuntary. Glands are always involuntary in that their activity cannot be controlled directly in response to instruction. Involuntary muscles differ in their microscopic anatomy from voluntary muscles. In the next section of this chapter you will see that the nervous system has one part which controls the involuntary responses and another which controls the voluntary responses. This division is not hard and fast, however. Certain reflexes of voluntary muscles can take place in the absence of conscious willing; certain involuntary responses can be brought under voluntary control. A group of important experiments conducted by Hudgins have to do with this second point.<sup>21</sup>

The natural, or inborn, response to a loud auditory stimulus includes the dilation of the pupil of the eye. A strong beam of light flashed into the eye leads, as we have seen elsewhere, to the constriction of the pupil. Both of these responses are involuntary.

Hudgins found that if a bell is sounded at the moment a beam of light is flashed in the eye of the human subject, the subject will after many repetitions respond to the sound of the bell alone by a constriction of the pupil. This is a conditioned response involving smooth muscles and is much harder to establish than condi-

tioned responses involving striped or voluntary muscles. By a clever experimental procedure, Hudgins found that the constriction of the pupil could be conditioned to the following kinds of stimuli: (1) a nonsense syllable spoken by the experimenter; (2) the experimenter's command, "relax"; (3) the gripping of an object by the subject; (4) the subject's saying aloud, "contract," "relax"; (5) the subject's whispering these words; and (6) the subject's *thinking* these words (repeating them in subvocal speech).

When the bell was sounded without the light, the well-conditioned subject would eventually lose his conditioning. This you will remember is experimental extinction, a phenomenon occurring when the secondary stimulus is presented frequently with the reward or punishment, i.e., the motivation, removed. (See p. 141.) Hudgins found, however, that the conditioned response to the verbal stimuli spoken by the experimenter or by the subject himself would not undergo experimental extinction. Evidently this problem is more complex than it at first appears, and we have much to learn.

*Does all thought (and learning) take place in the brain?*

Is it possible for thinking to take place entirely in the brain? We have gone a long way from the old notion that each brain cell houses a single idea, although we have seen that the use of symbols to represent absent objects depends upon the functional integrity of the association areas. Can nerve currents shuttle about in the brain without involving muscle groups elsewhere in the body until the finally worked-out conclusion is put into speech or action? According to the *central theory of thought* this is possible.

It is impossible to attack this important problem in the human being by crucial experiments. Such an attack would make it necessary to dissociate the entire muscular system from the nervous system. Even if this were possible, how could the subject report his introspections?

Various observations support the notion that the higher centers of association will not function unless they are reinforced from impulses coming from the voluntary muscle groups. Sherrington observed that monkeys in which the sensory return from a limb had been destroyed by surgery leaving the motor nerves intact

could make reflex movements of the limb when the appropriate area of the motor cortex was stimulated but were incapable of making effective voluntary movements of the limb concerned.<sup>22</sup>

Sensory return from the responding organ seems to be highly contributive both to the formation of conditioned responses and to their loss by the process of experimental extinction.

### *How the Nervous System Functions in Emotion*

YOU ARE now in a position to understand why, as we saw in Chapter 5, emotional responses, once conditioned, are so difficult to extinguish. The nervous control of emotional behavior differs from that of voluntary behavior in one very important respect. Speech, postural responses, and the movements of arms and legs are integrated through the cranial and spinal nerves; emotional behavior is brought about by a special division of the nervous system which we mentioned on page 679 but have not yet described. Refer to Figure 76*b* as you follow this discussion.

#### *The autonomic nervous system*

The visceral organs of the chest, abdomen, and other structures containing smooth muscles or glandular tissue are controlled by a system of nerves distinct from those which control the muscles of the skeleton, the organs of speech, etc. The part of the nervous system which sends fibers to smooth muscles and glands is usually called the *autonomic* or more simply the visceral nervous system. While we still use the former term, the latter is a better word since we now know that this system is neither autonomous nor automatic but is made up of a set of reflex arcs subject to the control of higher centers of the brain just as is the nervous system that activates the skeletal muscles. One striking difference between the two systems is that activities of the autonomic nervous system are largely reflex actions; little voluntary control of visceral functions is possible. Another difference is that the autonomic nervous system has synapses outside the central nervous system.

The anatomists have discovered that it is necessary to distinguish between two parts of the autonomic nervous system, the so-called sympathetic and parasympathetic divisions.

*The sympathetic chain.* Branching off from certain of the spinal nerves are smaller nerves made up of fibers running to a chain of ganglia (nerve centers) lying on either side of the spinal cord. The fibers run up or down in this chain and then synapse with fibers that run to smooth muscles and glands of the skin by nerves which rejoin the spinal nerves. At certain points nerves leave this chain and pass to outlying ganglia where they synapse with fibers that run to the visceral organs. Since these fibers come from only a dozen or so of the spinal segments in the middle of the back (thoraco-lumbar) but ultimately reach structures from the head to the toes, it is clear that they constitute a distributing mechanism. This part of the autonomic is called the *sympathetic* nervous system, because the older anatomists believed its function was to make the visceral organs work in "sympathy."

The action of the sympathetic system in an emergency emotion includes dilating the pupil of the eye, lifting the lid over-wide and protruding the eye-ball, stopping the digestive movements of the stomach and the peristaltic contractions of the intestines as well as the secretion of the digestive juices, increasing the rate of the heart-beat and raising the blood-pressure, and taking from the organs of sex their supply of blood with the result that they tend to become flabby. In hairy animals the hair stands on end, and this is seen as a vestigial response in our own bodies in the form of "goose-flesh." Finally, the adrenal glands are spurred to great activity and the adrenalin secreted duplicates the actions of the sympathetic system and hence reinforces all of the above actions.

*The parasympathetic chain.* From the lower segments of the spinal cord and from the brain stem originate certain nerves which look like ordinary cranial and spinal nerves. When traced, however, they are found, like the sympathetic nerves, to pass to visceral structures and not to the skeletal muscles. Like the sympathetic nerves, too, they are interrupted by a synapse outside the central nervous system. For these reasons such nerves must be counted a part of the autonomic nervous system. Since they branch off from the central nervous system above and below the sympathetic nerve fibers, they are known as the *parasympathetic* or the cranio-sacral division of the autonomic. Most of the organs of the chest and abdomen receive fibers from both systems, and where this hap-

pens, the action of the two systems is always antagonistic, one exciting the organ to increased activity, the other inhibiting or decreasing its activity. Thus the autonomic nervous system could be likened to the accelerator and the brake of an automobile and makes for a very accurate control of the visceral organs.

It is important to know under what conditions the parasympathetic system is dominant and under what conditions the sympathetic gets the upper hand. All of the ordinary vital functions of life are carried out by the parasympathetic system; to allow this, the sympathetic takes a back seat. In fact, the whole sympathetic nervous system has been removed from animals without greatly disturbing the ordinary processes of life. The parasympathetic protects the eye from bright light by constricting the pupil and adjusts the lens of the eye for near vision. Digestion of food, its passage along the alimentary canal, and finally the elimination of waste products are all actions depending on the parasympathetic nervous system. The sexual organs become suffused with a richer supply of blood by the action of this system.

If the parasympathetic is the drudge that carries on the everyday tasks of life and meets the minor exigencies, the sympathetic system is the "trouble shooter" which steps in and takes charge when there is a real emergency. It operates when the very life of the organism is threatened, and it calls upon all the reserves of energy which parasympathetic activity has built up and held in abeyance for just such emergencies. The sympathetic is known to take over under three conditions, when life is threatened by extreme cold, during violent effort or exercise, and during states of fear and rage. In the latter case the visceral changes can be regarded as preparation for "flight or fight," which go with these emotions. The liver pours out sugar to be used by the muscles, the spleen pours out more blood cells to carry oxygen, the bronchioles dilate so that more air reaches the lungs, the heart beats faster, etc. The digestive organs close up shop due to inhibition by the sympathetic system, and the blood is diverted to the muscles. In an emergency it is more important to be able to run effectively from danger than to digest one's lunch.

*Visceral sensation.* Traveling with the motor fibers to the viscera are also numerous sensory fibers coming from the visceral

organs. Those found in the sympathetic nerves are chiefly concerned with conducting pain impulses; those found in parasympathetic nerves are not concerned with pain but conduct impulses giving rise to organic sensations such as hunger, nausea, and sensations from the bladder and colon. The latter are necessary for the reflex control of the viscera in such functions as vomiting and micturition. The modern surgeon takes advantage of this double pathway of sensation from the viscera in relieving his patients of excruciating pain from diseased visceral organs by severing appropriate sympathetic nerves.

Ordinarily we are quite unaware of any movement going on in our viscera. The pupil of our eye will dilate in pain. We feel the pain but are unaware of the fact that the pupil has become larger unless we see it in the mirror. In other instances, when we think we are aware of our viscera, as in thinking we feel the heart-beat, we are really receiving the sensation from the chest wall, not over the sympathetic nerves to the heart. It is frequently observed by surgeons that, if the abdominal cavity is opened under local anesthesia, the viscera can be cut, pinched, or even burned without arousing pain. Yet we know that severe, unbearable pain can arise in the viscera in the form of cramps, stomach-aches, etc., and we are all familiar with strong sensations of hunger and nausea. The explanation is that because of the protected position of the viscera there has been no occasion for sensitivity to cutting and burning to be developed. Distensions and contractions, on the other hand have come to be adequate stimuli. It may be wondered why, if contraction is an adequate stimulus, we are unaware of the normal peristalsis of the intestines. This is a matter of *threshold*. When the contractions are normal in extent, as in the ordinary processes of digestion and excretion, they do not reach sufficient intensity to stimulate the sensory fibers; hence no sensation reaches consciousness. However, if they are strong, spasm-like contractions, as in diseased states or in extreme physiological states, such as a greatly over-distended bladder or colon, we may become very conscious of our viscera. Visceral sensations are really "danger signals" and bring us to the physician or compel us to some action which corrects the emergency physiological condition. The connection between visceral sensation and "drives" should thus be apparent.



Visceral sensations differ from those arising in skin in that they are diffuse and poorly localized despite their intensity. In fact, they are often wrongly localized and seem not to come from the viscera but from the skin. Thus, when severe pain originates in a diseased heart, it seems to come from the chest wall or sometimes even from a band running down the back of the arm. Such pain is said to be *referred*.

The resistance to experimental extinction of responses mediated through the autonomic nervous system has another and more fortunate connotation. You will recall from your study of Chapter 3, dealing with the human drives, that symbols, once they are adequately set up by a process of conditioning, become permanently capable of taking the place of physical satisfactions. Hunger, thirst, and skin-condition drives involve the autonomic nervous system. This same quality of permanency in the face of lack of reinforcement and in the face of outright extinctive happenings is of great adaptive service to man in maintaining the power of his secondary or symbolic rewards and drives.

### *The higher centers of emotion*

Clinical evidence has been of great value in helping to determine how the central nervous system functions in emotion.

*How does the cortex function in emotion?* Patients who suffer from lesions which functionally separate the cerebrum from the lower centers in the thalamus report that their emotions are exaggerated. A dog in which the cerebrum had been surgically removed showed intense emotional responses to stimuli which were ignored by normal dogs and by the same dog before the operation.<sup>23</sup> A playful pat on the side would cause the dog to whirl with fangs bared—so-called “sham rage.” Similar observations have been made on cats deprived of the services of their new-brains.<sup>24</sup>

Recent studies show that the cerebral cortex has a control over visceral responses.<sup>25</sup> All these observations would seem to indicate that the new-brain serves as a check on unrestrained emotional response. With the cerebrum intact the intensity of emotional response is proportional to the seriousness of the situation. The cat or dog without its cerebral cortex shows no such gradations in intensity, and the emotion it exhibits is only the most primitive emo-

tional behavior-responses to pain, rage, and fear and certain basic sexual responses. It is interesting to note in this connection that the feeble-minded, whose new-brains are of subnormal development, are more given to violent emotional outbursts than are normal persons. The "head" does rule the "heart."

We have seen that the presence of the functioning cortex serves to check the elemental expression of emotion. How does the cortex influence the subjective experience in emotion? This question can never be answered from experiments with animals, for animals are incapable of introspection. Clinical patients' reports are not trustworthy, for such patients are not skilled introspectionists. We are forced to doubt their ability to separate what they feel from what they think they are expected to feel. Up to the present, no skilled introspectionist has suffered a lesion in the right place to make possible this type of report. For the present we must agree with Harlow and Stagner that outward behavior in emotion and inner experience are not of necessity one and the same.<sup>26</sup> There is every reason to believe, and none to doubt, that the higher emotions or sentiments involve the cerebral cortex. By direct stimulation with an electric needle the cerebral cortex has been proved to control visceral responses. The association centers of the cortex are undoubtedly important too in adjusting the emotional response to the situation since conditioned emotional responses involve symbols. A decorticated man would not "die for dear old Rutgers," but he might bite at the hand that slaps him on the back on homecoming day.

*How do the thalamus and hypothalamus function in emotion?* We have seen that there is exaggeration of emotion after removal of the cerebral cortex. Physiologists since Sherrington have known that cutting away the cerebral cortex and the midbrain ends all display of emotion, though the animal continues to live. The region between the midbrain and the cerebral cortex (the "tweenbrain") must, therefore, contain centers for emotional expression. The important structures found here are the *thalamus* (Figure 76b and Figure 80a), which receives sensations from the whole body including the viscera; the *subthalamus*, just beneath it, which exerts control over the muscles of emotional expression; and the *hypothalamus*, still further beneath, which is an important

center controlling both the sympathetic and parasympathetic systems. Together they form the diencephalon or "tweenbrain."

Numerous clinical observations have shown that disease or tumor of this important region changes the whole emotional life of the patient. A lesion may bring about a condition of emotional apathy, even of narcolepsy or somnolence. The patient, when informed by the physician of his critical condition, does not appear to be worried; he shows a "fatuous serenity of mind with complete failure to appreciate the gravity of his own, physical condition."<sup>27</sup> Other patients may burst into uncontrollable laughter or tears while experiencing no emotion or even a contrary one. Other patients may experience emotion while giving little outward sign, their mask-like faces concealing their true feelings. Neither do the visceral responses correspond always in intensity to the emotion or pain felt, and the subjective experience may be greatly increased as described earlier in this chapter.<sup>28</sup>

We must conclude that this portion of the brain is concerned both with the production of emotional expression, as shown both in the face and in visceral changes, and also with the subjective sensations accompanying emotion. In fact, some believe that disarrangement of this region may be the cause of some of the common forms of psychopathological behavior. It may be safely predicted that with the full exploration of this tiny region will come an understanding of the factors controlling emotional life.

We have seen that maturation and learning bring about a gradation of emotional response. The all-or-nothing character of the infant's emotions and the unrestrained outbursts of the child are somewhat like the sham rage of the decorticate animal. On the side of maturation we can see in the maturation of the cortex the gradual emergence of adult emotional life. On the side of learning we can see in the establishment of conditioned emotional responses the functioning of the cortical association areas allowing for highly organized and integrated use of symbols.

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The human brain represents a compromise between specific localization of function and lack of rigid division of labor.

Neurologists study the function of the various parts of the brain

by removing areas and observing what happens, by studying the action currents during different kinds of activity, by stimulating the brain with an electric current, and by treating various parts with drugs known to stimulate or depress function.

Certain areas are called motor areas because movements occur when these areas are stimulated. Others are called sensory areas because the individual loses a particular sensibility when these areas are destroyed. Other areas are called association areas and appear to have the function of correlating sensory data. When these areas are destroyed, individuals suffer from aphasia, or inability to understand objects which can be seen or otherwise felt.

The numerous observations on the electrical phenomena of the brain indicate that different mental states are accompanied by different patterns of brain waves.

The autonomic nervous system is important in bringing about the bodily changes which are a part of emotion. Responses in which the autonomic nervous system is involved can be conditioned but are relatively resistant to experimental extinction.

### *Recommended Readings*

BRICKNER, R. M. *The Intellectual Functions of the Frontal Lobes*. Macmillan, 1936.

A detailed study of the only case in which a human being with a large portion of both frontal lobes removed has survived for several years and lived a fairly well-adjusted life.

CARLSON, A. J., and JOHNSON, VICTOR. *The Machinery of the Body*. University of Chicago Press, 1937.

Chapter 10 deals with the spinal cord and brain as mechanisms of correlation.

PIÉRON, H. *Thought and the Brain*. Harcourt, Brace, 1927.

A French physician and psychologist describes the behavior of World War soldiers resulting from brain lesions.

WEISENBURG, T., and McBRIDE, K. E. *Aphasia; a Clinical and Psychological Study*. Commonwealth Fund, 1935.

A neurologist and a psychologist report the results of testing and observing sixty clear-cut cases of aphasia compared with a normal group.

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